FLYING

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YOURS WITH A *Taylorcraft*

Cleaner lines that cut your flying time and cut Flying COSTS

A 3-TIME RACING WINNER

Taylorcraft is the fastest light plane in the sky for its weight and horsepower—a 3-time winner of the Firestone Speed Trophy at Miami. No other light plane can claim this distinction!

Taylorcraft has always been known as a "clean ship"—sleek—streamlined. With a racing-type wing of the same design as that of the army's fast pursuit ships, Taylorcraft is aerodynamically correct!

This "air-grease" inherent in Taylorcraft design sends this ship along its course faster, farther on its load of gas—and with less elapsed time for a given throttle setting. And less time in the air means time saved on the engine—gas saved in the tanks—and lower all-around hour operating costs.

Remember, in no other light plane are all the desirables of speed, maneuverability, safety, performance, economy, and low landing speed so nicely balanced. It is definitely to the advantage of your pocketbook and to your flying pleasure to "go Taylorcraft."

Mail Coupon for "This Is Taylorcraft" — a 24-page brochure in full color.

TAYLORCRAFT AVIATION CORPORATION
ALLIANCE, OHIO
World's Largest Builders of Side-by-Side Airplanes

Taylorcraft Aviation Corporation
Alliance, Ohio

Please send my free copy of "This is Taylorcraft."

Taylorcraft

Street Address

Attention:
Mr. A. W. Sims

City

Fuel-carrying economy is in the bag

THERE are no expensive "frills" on practical small airplanes such as the Republic Seabee. Every component has to pay its own way in utility, long life, and easy maintenance. Cost *is* an object.

B. F. Goodrich bladder-type fuel cells fit right into this economy picture. By preventing gasoline leakage-through-the-skin (which can happen with metal gasoline compartments), these cells add a new factor of safety and save many hours of maintenance.

Production line economies are important cost cutters. Installation of B.F. Goodrich bladder cells is a simple matter of folding them up, pushing them into the tank cavity and snapping them into place with built-in fasteners.

B. F. Goodrich builds these cells in layers of synthetic rubber and nylon fabric. They are specially designed for toughness and high abrasion-resistance, yet they are completely flexible. Cells have been developed covering weight and strength requirements for all types of airplanes . . . from paper-thin tanks for light loads to high-strength, large volume tanks for big transports. All guard against leakage; all add shock resistance; all hold down maintenance.

B. F. Goodrich cells should be designed into new ships; they can be adapted to many ships now flying. For facts, write to *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

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FLYING

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THE COVER

Two-place Taylorcraft shown on this month's cover represents its manufacturer's first post-war bid for the trainer and personal plane market. Pilot Eddie Lyons, president of Lyons Flying Service, Amityville, N. Y., is at the controls. Rudy Arnold took the photo.

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SINGING A SONG OF SILVAIRE?

So you've got a new zest for zooming? Well, being air-minded ourselves, we say, more power to you! You're headed for a better way of getting places and doing business. And we think you're headed OUR way too.

You'll probably be landing that Luscombe Silvaire at various big and small fields dotting America's great Middle-West—on Phillips territory. So keep an eye peeled for our "66" sign.

It means, "Here's where I get Phillips Aviation Products!" Yes, lubricants that help keep things gliding . . . specially manufactured UNLEADED 80 octane gasoline for better performance and a cleaner motor. (We TOLD you we were air-minded!)

Fly right! And we'll be serving you . . . at the "66" pumps! The Aviation Department, Phillips Petroleum Company, Bartlesville, Okla.

Phillips 66

AVIATION GASOLINE

HANGAR FLYING

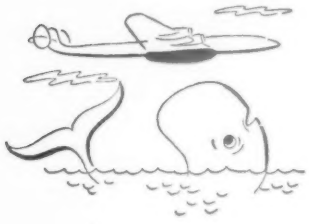
LOCKHEED

The Whaleboat

In Building 82 at Burbank, engineers have been fussing over a remarkable object that looks like a dural whaleboat on wheels. It's the *Constellation's* new Speedpak and it's a lot more useful than a whaleboat, except maybe to whalers.

With the Speedpak, fast handling of air cargo is made possible for the first time.

This is the way it works: The Speedpak is loaded independently of the ship (which may be in service somewhere else at the time.) When the plane arrives, the Speedpak is attached to the bottom of the fuselage. Off the *Constellation* flies with the Speedpak clinging to its



belly, full of over four tons of additional cargo. At any stop the Speedpak can be lowered, loaded and lifted in a matter of minutes.

For all its 395 cubic-foot capacity, the Speedpak slows the plane down less than 10 mph, which is peanuts for the five-mile-a-minute *Constellation.*

The Speedpak is a new solution to the cargo problem. But new ideas are old stuff at Lockheed —ideas that make good hangar flying and better air transport.

L to L for L

© 1946, Lockheed Aircraft Corp., Burbank, Calif.

LETTERS

REVISE THOSE REQUIREMENTS

A friend of mine who has flown many hours of dual is unable to get an okay for solo because he had a mastoid operation performed over 30 years ago. Is there any reason for such a regulation? If not, why doesn't the CAA eliminate it?

P. E. REILLEY

Omaha, Nebr.

● FLYING's editors called on Dr. Sherman A. Thomas, Chief of Airman Standards Division, CAA, for an answer to Reader Reilley's question. He writes:

"Deficiencies of hearing, amputations, and even blindness in one eye are merely listed on the student pilot's medical examination. He can solo just as soon as his flight instructor thinks he is capable. After the final private flight examination, if the CAA inspector or authorized examiner feels the man is qualified, he will be issued a private pilot's license regardless of what his medical history may be. As a matter of fact, CAA has issued such licenses to deaf mutes who were otherwise exceptionally well qualified."

SHERMAN A. THOMAS, M.D.
Chief, Airman Standards Div., CAA
Washington, D. C.

ROTATING ENGINE

I once told several pilots stationed here that I had seen an old airplane with a rotary engine. I explained that the crankshaft was stationary and that the engine rotated with the propeller at the same speed. One of the pilots had heard of such an engine; others considered it impossible. I don't know the name of the airplane or the engine but it was built around the time of the first world war.

Would you send me any available information about the airplane or engine?

RICHARD O. ROGERS

Salzburg, Austria

● The engine in question was the French Monosoupape *Gnome.* Two types were used on World War I aircraft—a 100-h.p. version with nine cylinders and an 80-h.p. with seven cylinders.—ED.

THEY'RE NOT AERONAUTS

In the article "Variable Pitch: The Lightplane's Gearshift" (May issue), I believe the term aeronaut has been used incorrectly. An aeronaut is the pilot of an aerostat, not an aerodyne.

PVT. JAMES A. MANSON, JR.

Geiger Field, Wash.

PROPER PROPPING

In the July issue of FLYING there was an article entitled "College Flight Club." One of its illustrations shows the president of the club propping an *Ercoupe.* You will note he is balancing on the right foot, whereas to swing a prop correctly one should stand on the left foot and swing the right leg slightly forward, then backward as the propeller comes down. In this way one's body is swung backward and out of the arc of the prop.

I am not so much interested in how President Minton props a plane as I am in giving youngsters the right idea. Perhaps one can prop a lightplane most any way and get by, but try this incorrect stance on a larger plane and you may lose a hand or foot.

Doc HESS
AOPA-15913

Glendale, Calif.

● Reader Hess is right. President Minton posed for the photo improperly.—ED.

CLOSE SUPPORT—ARMY STYLE

After reading "Invasion Support—Navy Style" (March issue) by Lawrence E. Watkin, I'd like to put in my two cents worth.

If Mr. Watkin wants to read of something really close, have him look up the support given the Chinese Infantry, the British 36th Division and, most of all, Merrill's Marauders in northern Burma. Let him read of Major Allred who scored a bulls eye on a Jap pill box not a few hundred, not 100, not 50, but 13 yards in front of American ground troops at Myitkyina during the siege of that town. Let him read of the 88th squadron flying off of a muddy strip within 1,500 yards of Jap positions for a period of several months of the worst weather in the world, the Burma monsoons. The 88th gave ground troops the closest support they were given in this war—with high explosive bombs at 25 to 50 yards.

When Mr. Watkin speaks of "close support that was really close, a few hundred yards," he's not even in our class. If any one of us at Myitkyina missed a target by over 15 yards we were endangering American and Chinese lives and Major Allred would take us off ground support targets and give us easy targets like bridges and supply dumps. Give any one of us who were at Myitkyina a P-40N-5 with two 500-pound bombs or three 250-pound bombs and we'll lick the pants off of your so-called Navy flyers with their "small, fast, maneuverable, heavily armored" planes.

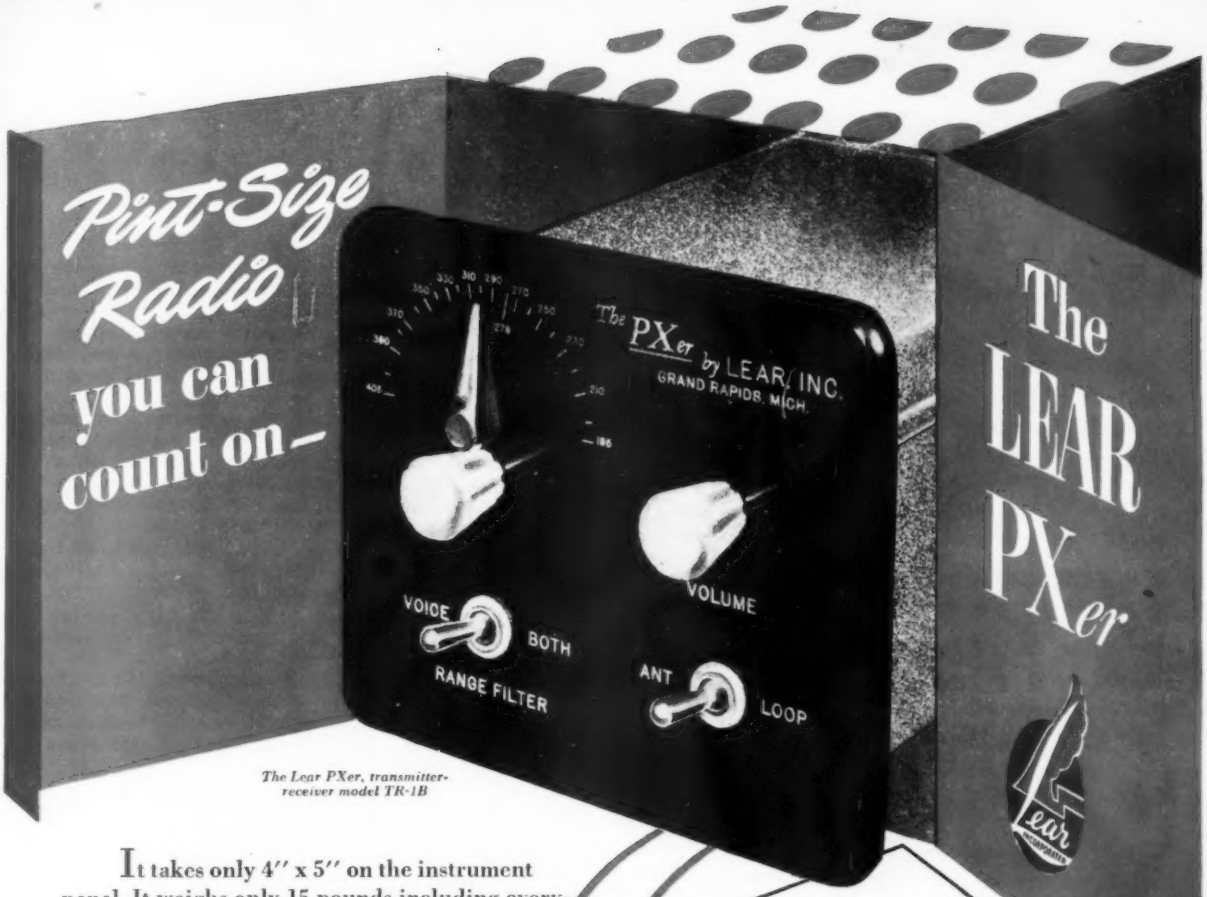
CHARLES F. HEIL

Mt. Ephraim, N. J.

WHAT DID HE LEARN?

"I Learned About Flying From That" in the March issue caused me to wince and wonder. I was really feeling for the guy until I turned to page 118 and read the explanation of his so-called decision.

(*Continued on page* 104)



The Lear PXer, transmitter-receiver model TR-1B

It takes only 4″ x 5″ on the instrument panel. It weighs only 15 pounds including everything. Yet the Lear PXer is a dependable, far-reaching radio transmitter-receiver that spells peace of mind for the light-plane user.

It means that the private pilot can keep in contact with the fields — know what weather's ahead — follow the beams, check the ranges — and fly across country with all the confidence and safety of a transport pilot.

Lear Radios are flying everywhere — from Alaska to South America. For 16 years they have held an enviable reputation for outstanding dependability.

This is why you'll want a Lear PXer in your personal plane. Read over the facts in the panel — or write for further information. LEAR, Incorporated, Aviation Radio Sales, 110 Ionia Avenue, N.W., Grand Rapids 2, Michigan.

CHECK LIST OF FEATURES OF THE LEAR TR-1B PXer

- ★ Weighs only fifteen pounds complete — transmitter — receiver — power supply — mike and phones
- ★ Low price
- ★ Range filter
- ★ Provision for direction finder
- ★ Dependable
- ★ Highly sensitive and selective

LEAR RADIO

The Name Men Fly By

Order from any aviation dealer — or specify Lear Radio when you order your new personal airplane.

MURDOCK HEADPHONES *Spell Safety* IN FLIGHT!

YOU'VE an important decision to make the day you select Headphones for your plane. The best radio equipment in the world won't get you first-rate reception if you're using second-rate Headphones.

In an emergency you want to get your message through and back!

Men who have logged thousands of hours in the air depend on MURDOCK Headphones to bring out the best in their radio under the toughest of flying conditions.

And you can depend on MURDOCK to give you easy-on-the-ear comfort, too. Their comfort, solid-built construction, close tolerances, and super-sensitivity are some of the reasons why ground signals and conversation come through with exacting fidelity.

For relaxation and safety in flying, be sure to insist upon MURDOCK Headphones! Ask your dealer about them, or write today for descriptive bulletin.

WM. J. MURDOCK CO.
210 Carter St., Chelsea 50, Mass.

HAVE YOU HEARD?

. . . **Now you can buy a plane on the installment plan.** The Universal C. I. T. Corp. has announced a plan for financing personal aircraft sales similar to those used in automobile financing. Costs include insurance on the plane and a bail bond certificate. The plan calls for one-third down payment, the balance to be paid over a period of up to two years with interest figured at five per cent a year. It is limited to planes having a gross weight of 3,000 pounds or less and a sales price not exceeding $7,500.

. . . **Ten pounds free baggage allowance for sports equipment** is now provided by Mid-Continent Airlines. Checking on the weight of various sporting gear, the company found a set of 14 golf clubs and bag weigh 22 pounds; a shotgun and case, nine pounds; and fishing equipment varies from 10 to 40 pounds. While the 10 additional pounds won't cover the entire rig, in many cases it can be shared with the 40-pound regular allowance.

. . . **Contracts for development of atomic engines** to power global-ranging aircraft of the future have been given Fairchild Engine & Airplane Corp. Several scientists have been engaged and a number of universities will co-operate in the research. Principal problem is how to harness atomic energy with a mechanism compact and light enough to go into an airplane. Because of deadly gamma rays, it is probable that atomic aircraft will be pilotless.

. . . **Aviation is really going to school** now that 19 states have adopted comprehensive aviation education programs and 15 others are developing such plans with the co-operation of the CAA. Even where there is no state-wide plan, a large number of schools give aviation courses. In many places, high school students are given flight training as a form of laboratory experience in conjunction with classroom studies.

. . . **Aircraft now in use will be outmoded in 18 months,** Gen. H. H. Arnold declared at a recent press conference. "Up to now everything has been [built for] pilots," he said, "but in the future military aircraft will be controlled remotely by electronics rather than mechanically."

. . . **Helicopter-bus service** should be available within two years, Greyhound Bus Co. officials predicted after studying results of tests in Detroit. Two four-place Sikorsky S-51 helicopters, purchased by the bus company at a reported price of $48,500 each, were used for the experiments. They picked up passengers brought to the testing area by bus and transported them to a country club, 40 miles away.

. . . **The largest tires ever produced,** 9 ft. 2 in. in diameter, are being used on the XB-36. Measuring 36 inches from one sidewall to the other, they contain more than 735 pounds of rubber, 420 pounds of fabric and about seven miles of bead wire. Each unit, comprising tire, tube and Goodyear wheel and brake, weighs 4,000 pounds.

. . . **A "suggestion award plan"** at Northrop Aircraft, Inc. replaces the War Production Drive plan. Payment is based on the amount saved during a year's operation of the employee's idea. Ten per cent of this saving is set aside for the employee.

. . . **More than 25,000 employees of U. S. airlines are World War II veterans,** according to reports made by the Air Transport Association of America. Representing nearly one-third of total airline employment within the U. S., the veterans are working in a variety of jobs, including sales and administrative positions as well as flight and ground operations. While some are pre-war employees, more are new recruits.

. . . **The knot will be the standard aeronautical unit of speed** and the nautical mile the corresponding unit of distance, through an agreement made by the AAF and the Navy. This facilitates plotting on aeronautical charts because a nautical mile equals one minute of a great circle of the earth. Both AAF and Navy will specify the use of the knot and nautical mile in all future procurement of air speed indicators, charts, and related equipment.

. . . **Airplane Spotter Mario Leotta** found a peacetime use for his talent when police failed to find a trace of his stolen taxicab. He hired a Piper Cub, cruised over the area near New York City for a couple of hours, and spotted his cab in some marshland. He came down, recovered the cab and found it only slight damaged.

. . . **Soloing despite the crippling effect of infantile paralysis** was the recent achievement of Ted Michel, 19 years old. Only special gear he used was an aluminum clip, which held his crippled right leg to the rudder pedal. He made the device himself. END

Cockpit Check

YES, you are going to be giving a lot of "cockpit checks" to the new planes, especially if you are planning to buy. There's one thing you'll particularly want to check — the instruments.

When you see "Kollsman" on the instruments of the plane you're "inspecting," it's a sure sign that the manufacturer stopped at nothing to provide that plane with the highest possible degree of usefulness and safety. And, best of all, getting the name "Kollsman" on your instrument panel does not add appreciably to its cost. For the new Scout instruments by Kollsman are *really* modest in price. So there's no reason, now, why *every* plane owner may not have the very best! Now, the best costs so little.

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These Planes Feature Scout Flight Instruments by Kollsman

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Symbols indicate number of instruments
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THE "*Know How*"

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Firestone has the Merchandise — top quality, popular, complete, quick selling. Firestone has the Plans — aggressive selling and merchandising plans that increase volume at a steady pace and

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Firestone is First **WITH A COMPLETE**

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New opposed engines

for submerged installations!

NEW JACOBS liquid cooled opposed engines of 100 and 165 hp . . . make the long sought personal pusher-type plane aerodynamically cleaner, more economical to build, quieter to fly in, and more practical to operate.

These 4 and 6 cylinder liquid cooled engines make it possible to design new pusher types without regard for fan weight or horsepower reduction hitherto the penalty of cooling fan operation.

There is no extra bulk for housing and ducting; and the radiator can be remotely located for the highest aerodynamic efficiency. Since the radiator is of the high velocity, negative-drag tunnel type, the expansion of cooling air actually adds a thrust effect!

In addition to these liquid cooled models, Jacobs also offers two new air cooled opposed engines rated at 100 and 165 hp. All four models feature fuel injection—cancel out carburetor icing hazards, insure better performance and longer engine life!

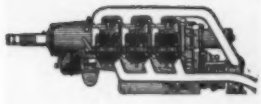
ENGINES like these have never been available before . . . but Jacobs, largest wartime producer of radial aircraft power plants in the 200 to 450 hp range, not only builds them *now* . . . but backs their performance with proven stamina, dependability, and the easy, low cost maintenance that made Jacobs a pilot's choice when pilots owned their "airlines"...when bush country flying began!

See these new era engines at the

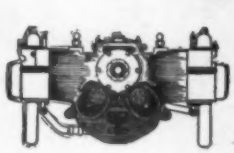
National Aircraft Show

Cleveland, Ohio . . . November 15-24

Jacobs Aircraft Engine Company



Reverse cooling on the air cooled opposed engines operates through single duct below propeller shaft; forces air up, over and down sides of cylinders—uses exhaust heat to warm manifold, improves combustion.



Head-on view shows compactness that permits more efficient airfoil housing . . . Location of magnetos in front and all other accessories on the rear case simplifies installation, speeds up inspection and servicing, helps keep "on the ground" costs low!

JACOBS • Pottstown, Pa.

LOWER WING LOADING'S THE SECRET BEHIND

AERONCA'S GREATER SAFETY_FLYING EASE

A HONEY IN DESIGN AND PERFORMANCE! Here's the sleek, New De Luxe Aeronca Chief, luxurious side-by-side model of the Aeronca family . . . now coming off Aeronca's mass-production line in quantity!

● FASTER TAKE-OFF! Up and away in Aeronca! Even on small fields close-to-field obstacles are cleared easily.

● TURNS IN SMALLER RADIUS! Yes, there's greater all 'round maneuverability. Slight pressure on controls brings quick action.

● LOWER LANDING SPEED! It's only 38 mph—and that means Aeronca's landing run is less than 350 feet!

No other side-by-side plane priced so low matches AERONCA CHIEF in this vital feature!

Wing loading, according to the books, means the total weight of an airplane divided by its wing area.

There's the *technical* meaning, but the important thing is what Aeronca's lower wing loading means to *you* as a flyer.

Here it is in a nutshell: It means greater maneuverability . . . and so, naturally, greater safety and flying ease.

Yes, on take-offs, in the air, on landings . . . Aeronca's superior engineering and aerodynamic design make for the kind of flying you've always dreamed about!

And talk about comfort! In the Aeronca Chief you enter through a wide, safety-swing door. You sit in luxurious, deeply upholstered seats. There's a large baggage compartment in the rear and a convenient map-and-glove compartment within easy reach. Oleo landing gear cushions your landing. Mechanical starter—operated from cabin — is standard equipment. And the easy-to-read instrument panel is truly a thing of beauty!

See the Aeronca Chief—fly it—compare it with any other low-cost plane. Why not arrange for a demonstration flight this weekend at your nearest Aeronca dealer?

Aeronca Aircraft Corporation
Middletown, Ohio

Over 1000 Aeronca Qualified Dealers to serve you at handy airports all over the U. S. A.

SO SAFE — SO SIMPLE — NOW ANYBODY CAN FLY

AERONCA America's No.1 Low Cost Plane

SIKORSKY AIRCRAFT DIVISION SELECTS AIRADIO AS STANDARD EQUIPMENT ON FAMOUS NEW S-51

"World's Most Modern Aircraft Radio" Scores Another Hit in New Commercial Helicopter

It rises and descends vertically; flies forward, backward or sidewise; can hover motionless in the air or fly at any speed up to 103 m.p.h. *It's the new Sikorsky S-51 helicopter!*

To insure the best two-way communication for the S-51, Sikorsky Aircraft Division naturally chose Airadio as standard equipment. Like other leading aircraft manufacturers, they found, through rigid tests, that Airadio is outstanding in design and performance.

Important Advantages

Take a tip from one of the world's greatest aircraft manufacturers—install the SUPER "52" in your plane. Radio range, standard broadcast, control tower and interphone are at fingertip control. In addition, you'll have the advantage of long range reception and transmission, easy and convenient installation and standard size components replaceable anywhere—plus the assurance of uncompromising quality built-in by Airadio's pilot engineers.

WRITE TODAY FOR PARTICULARS ABOUT THE "WORLD'S MOST MODERN AIRCRAFT RADIO"

Receiver, weight 3 lbs. 4 ozs.

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this bird can fly backwards

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Edo XOSE-1

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The Beechcraft *Bonanza*

you'll have to see it!

• This brand new Beechcraft product which has been tested and re-tested for many months is ready for public inspection. The *Bonanza* sets new standards of performance and economy that have not been approached previously. In order to believe the engineering achievements incorporated in this airplane it must be seen. A *Bonanza* demonstrator is, or shortly will be, available at the Beechcraft Distributors listed at right. We suggest an early contact for an appointment.

Basic *Bonanza* Performance

Cruises at 175 mph . . . Consumes 10 gallons per hour . . . Range 750 miles at 165 mph . . . Carries 4 people and 100 pounds of baggage . . . Lands at 46 mph . . . Has a direct operating cost of as low as 1 cent per passenger mile . . . Radio and night equipment is standard.

Anderson Air Activities, MILWAUKEE, WIS.
Atlantic Aviation Corporation, NEW YORK, N. Y.
Atlantic Aviation Service, WILMINGTON, DEL.
Beechcraft Factory Branch, ORLANDO, FLA.
Airplane Sales Division, Butler Company, CHICAGO, ILL.
Challenger Airlines, Inc., SALT LAKE CITY, UTAH
Dallas Aircraft Sales, Inc., DALLAS, TEXAS
Francis School of Aviation, DETROIT, MICH.
Harrington Air Service, MANSFIELD, OHIO
Aircraft Division of R. L. Harrison Co., ALBUQUERQUE, N. M.
Hawthorne Flying Service, ORANGEBURG, S. C.
Interstate Airmotive, Inc., ST. LOUIS, MO.
Harold S. Johnson, LOUISVILLE, KY.
North Side Motors, MINNEAPOLIS, MINN.
Ohio Aviation Company, DAYTON, OHIO
Pacific Aircraft Sales Co., OAKLAND, CALIF., BURBANK, CALIF.
Page Airways, Incorporated, ROCHESTER, N. Y.
W. U. Paul, CORPUS CHRISTI, TEXAS
Philadelphia Aviation Corporation, PHILADELPHIA, PA.
Pittsburgh Aeronautical Co., HOMESTEAD, PA.
Plains Airways, CHEYENNE, WYO.
J. D. Reed Company, HOUSTON, TEXAS
Southern Air Services, MEMPHIS, TENN.
Southern Airways Sales Co., Inc., ATLANTA, GA.
Southwest Aviation Service Corp., OKLAHOMA CITY, OKLA.
Topeka Aircraft Sales & Service, TOPEKA, KAN.
Tulsair Distributors, TULSA, OKLA.
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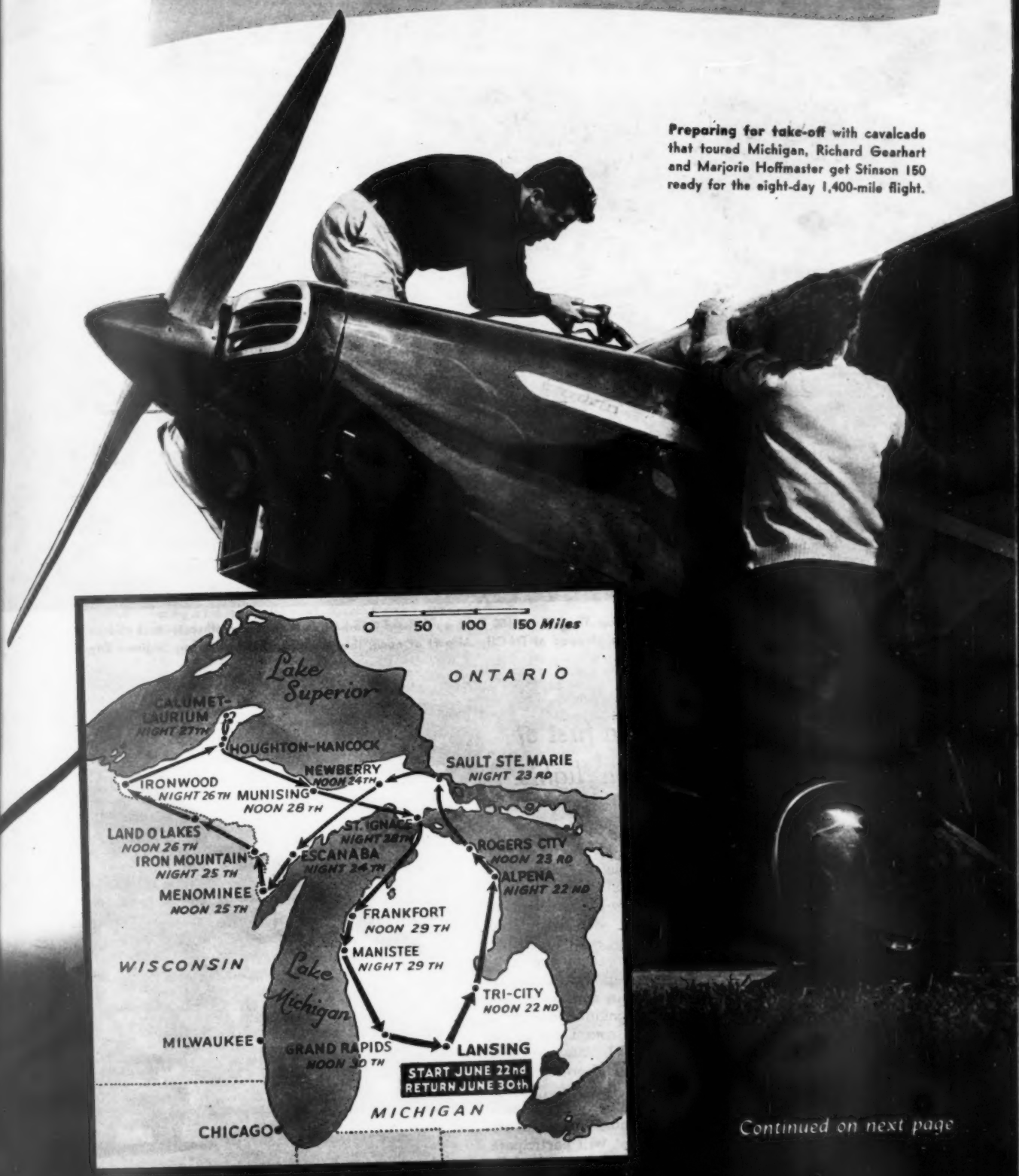
CORPORATION WICHITA, KANSAS, U. S. A.

FLYING
OCTOBER
1946

Michigan Air Tour



Preparing for take-off with cavalcade that toured Michigan, Richard Gearhart and Marjorie Hoffmaster get Stinson 150 ready for the eight-day 1,400-mile flight.

Continued on next page

Approaching Alpena Airport for first overnight stop. The Stinson 150 flown by Richard Gearhart and Marjorie Hoffmaster took off from Lansing with the other touring planes in the morning, stopped at Tri-City Airport at noon, then headed northward along Saginaw Bay.

Sixty-one planes take part in first of Michigan's post-war vacation flights.

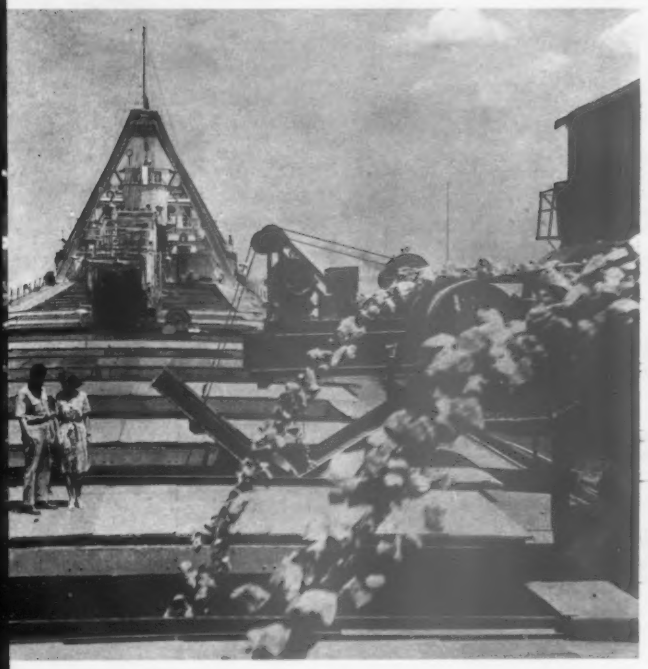
Photographs by Arthur Haug

FROM all over Michigan, late in June, aviation enthusiasts gathered in Lansing to tour their home state. Among them were Richard Gearhart of the state conservation department, and Marjorie Hoffmaster of Lansing, who discovered the fun of an aerial vacation tour by flying together in a Stinson 150. The Michigan air tour was sponsored by the state department of aeronautics to help promote private flying in the state. The department organized the tour and made reservations for participants. From a twin-engined Beech to two-place lightplanes, 35 aircraft started from Lansing on June 22. Eight days and 1,400 miles later 21 planes crossed the finish line. During those eight days, 61 aircraft, at one time or another, participated in the tour, flying a total of 50,000 miles. Although the trip was marred by two accidents —the first in the history of Michigan air tours—participants were agreed on the tour's success and most will participate in two later air cruises which are scheduled for early fall.

The tour starts. Stanley McWhinney, state aeronautics department supervisor, flags planes off at Lansing port.

After landing at Alpena Airport, Richard and Margie tie down their plane for the night. They found that accommodations at the Grand Lake Hotel, plus entertainment, had been arranged in advance by the tour's directors. The pair were enjoying the flying vacation.

Tossing pennies before take-off Sunday. Left to right are Walter Hornack, Benton Harbor; Robert Anderson, Detroit; Arlene Davis, Cleveland, O.; Floyd E. Evans, state aeronautics director; Mr. and Mrs. Caesar Lucchesi, South Range, and Lester Brown, Benton Harbor.



Sightseeing on a lake freighter. Stone pours into the hold from the world's largest limestone quarry at Rogers City.

A midday snack tastes mighty good after the strenuous Sunday tour of the big limestone quarry, docks and ship.

Checking their plane at Escanaba. Dick gasses up while Margie pours some oil into the Stinson's Franklin engine.

Hydroplaning on Green Bay was great fun, too. Dick and Margie rented the speed boat at Escanaba Monday evening.

King's Gateway Airport, straddling Wisconsin-Michigan border, looks like this from nearby ski slide. Smoke is guide for wind direction. Two state officers (inset) who accompanied tour plot their course while Dick and Margie (below) walk into airport offices.

Minor adjustments are made by Air Tourist Howard Hartung of Detroit on his Beechcraft biplane.

Bowling is evening's entertainment at Ironwood where the aerial tourists made an overnight stop on Wednesday. Margie is a good bowler but Dick (right) beat her.

Bull sessions went on at all hours during the airport stops. Dick and Margie talk with other air tourists at Ironwood Airport, waiting to go into the town.

William B. Stout, automotive inventor and aircraft designer, entertained air tourists at Pinecrest Resort near St. Ignace.

Prop blast from engines warming up attracted children at practically every stop the tour made. Townspeople turned out in numbers at all cities the flyers visited, though the only official welcoming delegation was at Escanaba. Citizens went out of their way to treat flyers cordially.

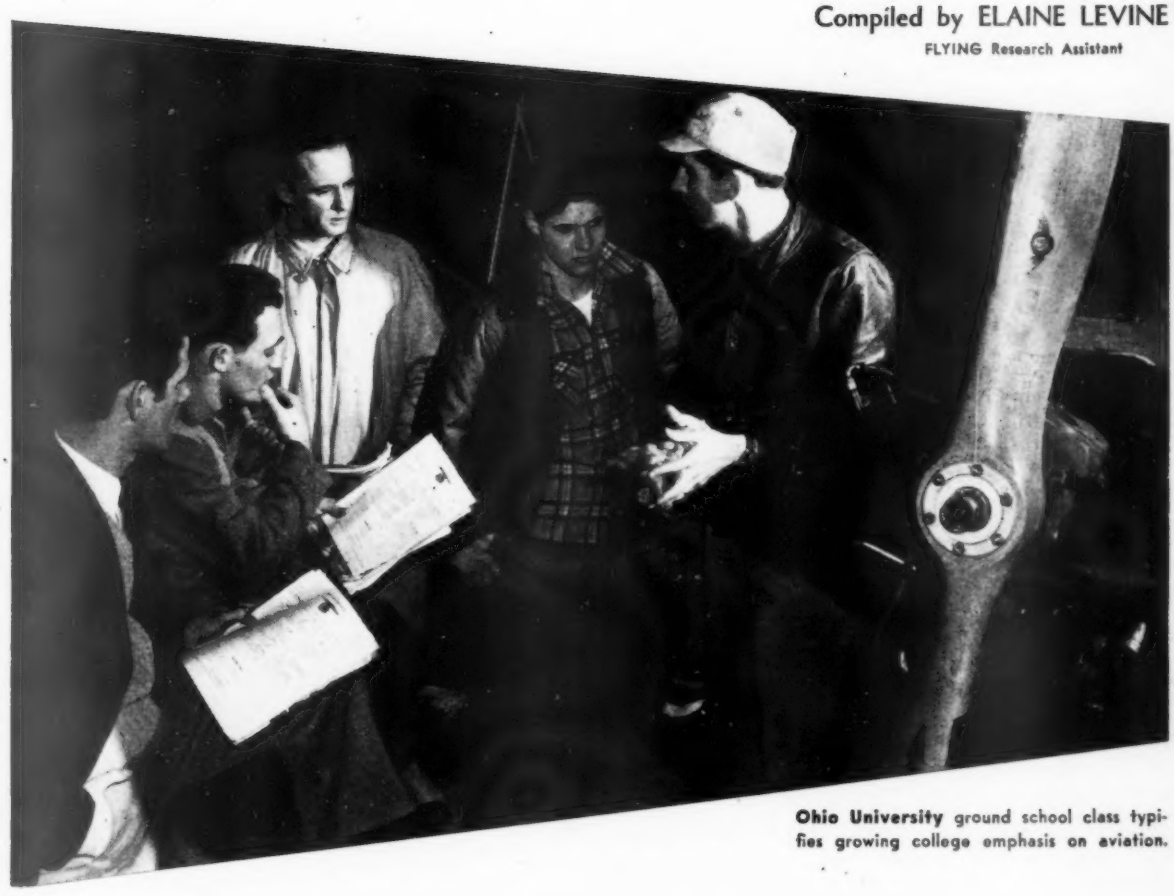
Touring planes at Tri-City Airport are inspected by the townspeople. Airport crowds at every stop indicated an active interest in private flying. Planes here include twin-engined Cessnas, Luscombe, Ercoupe, and a Stinson 150. Other planes on the tour included Beechcrafts, AT-6 and PT-19.

Barnstorming was avocation of Harvey Hughes, who operates Hughes Flying Service at Lansing. Hughes mixed business with pleasure by selling rides to local sightseers at every night stop. His Cessna gave many Upper Peninsula citizens their first ride in a twin-engined plane.

Gay watermelon feast and lake trout fish fry wound up the air tour back at Lansing. Mrs. Hughes was host at her nearby farm. Plane in which Photographer Haug was flying made a forced landing on way to Lansing because of a broken oil line. A special car got the group to the party.

Aviation on the Campus

Compiled by ELAINE LEVINE
FLYING Research Assistant



Ohio University ground school class typifies growing college emphasis on aviation.

Want to major in aviation? Here's what the colleges offer.

STUDENTS looking forward to a career in aviation can choose from nearly 200 colleges which offer advanced aeronautical training in the academic year beginning this fall. FLYING has just completed a survey of nearly 1,700 of the nation's principal colleges and universities. (Commercial aviation schools, many of which offer excellent courses, are omitted from the survey but will be covered in a subsequent issue.) Results indicate the growing importance of specialized training programs for aviation.

The most interesting trend is the wide variety of aeronautics courses offered. Students may earn degrees ranging from a five-year aeronautical engineering degree to a certificate in aeronautical secretarial science, or from general airline operations to aero technology. There are actually two schools, Columbia Bible College and Bob Jones University, which offer electives in missionary and ministerial aviation.

The University of Baltimore and the University of Texas offer degrees in air transportation. A two-year degree in aeronautical secretarial science is awarded by Colby Junior College. Aeronautical Maintenance engineering degrees are given by two schools.

Aeronautical courses for future high school instructors appear on the curricula of at least six state teachers colleges.

While only eight of the 187 colleges give degrees in airline operation, a master's degree in this subject is offered by the University of Denver.

Particularly important is the prominence given to aeronautical engineering. (*Continued on page* 84)

TURN PAGE FOR A COMPILATION OF COLLEGE AVIATION CURRICULA.

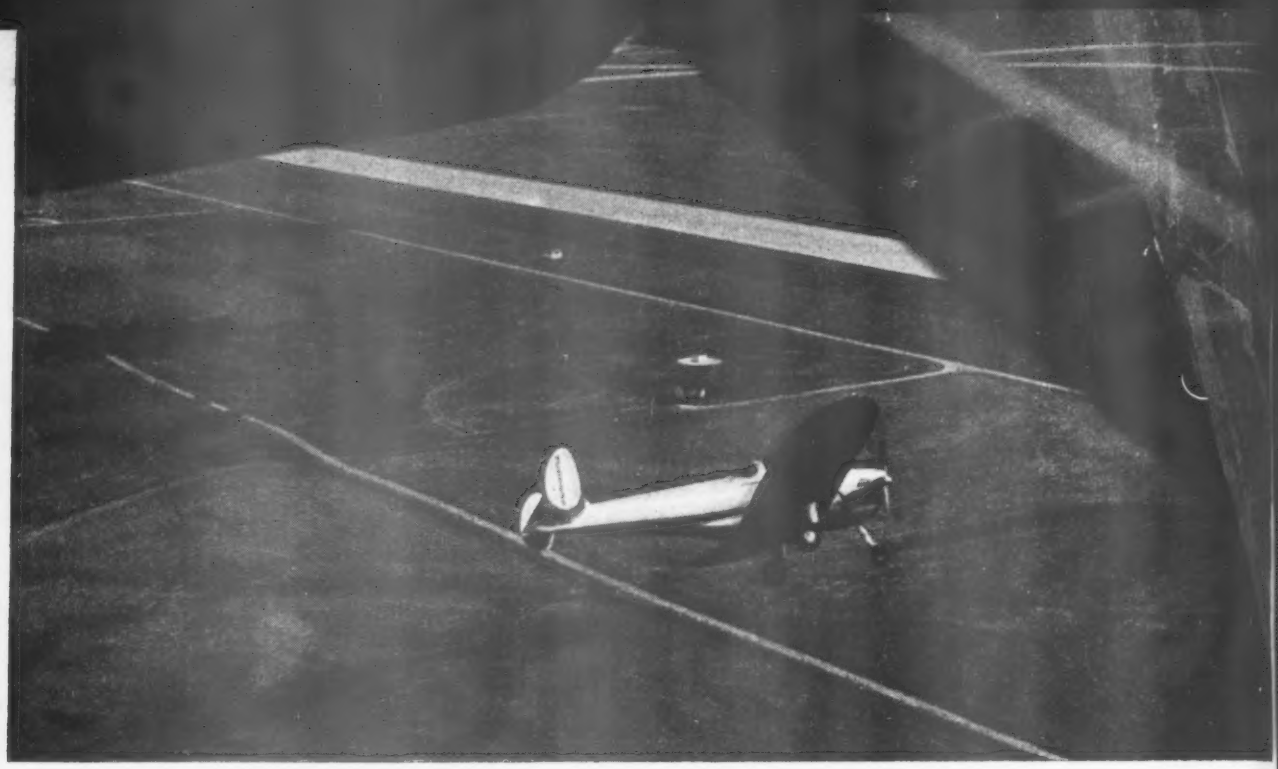
U. S. College Aviation Courses, 1946-47

	Degree in airline operations?	Degree in aeronautical engineering?	Degree in other aviation subject?	Courses leading to private license	Courses leading to commercial license	Courses leading to instrument rating	Courses leading to other rating	ADVANCED WORK OFFERED IN: Aerodynamics	Air transportation	Aircraft construction	Aircraft design	Aircraft electricity	Aircraft engines	Aircraft materials	Aircraft mechanics	Aircraft propellers	Aeronautical drafting	Aeronautical physics	Air law and CAR	Airport construction and design	Airport management	Analysis of aircraft structures	Aviation education	Commercial air operations	Flight instruction	Meteorology	Navigation	Radio construction	Wind tunnel operation	Other
Ala. Poly. Inst., Auburn, Ala.	◢		1	◢	◢	◢		◢		◢	◢	◢		◢			◢		◢		◢	◢		◢	◢	◢				◢
State Teachers Col., Florence, Ala.			2	◢	◢		◢																	◢	◢	◢	◢			
State Teachers Col., Jacksonville, Ala.	◢			◢	◢																			◢	◢	◢	◢			
U. of Alabama, University, Ala.	◢			◢	◢			◢		◢	◢					◢					◢									◢
Gila Jr. Col., Thatcher, Ariz.	◢		3	◢	◢																									
Ark. State Teachers Col., Conway, Ark.				◢	◢							◢					◢			◢						◢	◢			
Harding Col., Searcy, Ark.				◢	◢															◢						◢	◢			
Little Rock Jr. Col., Little Rock, Ark.				◢	◢	◢														◢						◢	◢			
Ouachita Col., Arkadelphia, Ark.				◢	◢	◢		◢				◢		◢						◢						◢	◢			
U. of Ark., Fayetteville, Ark.	◢			◢	◢	◢		◢		◢	◢	◢		◢			◢			◢						◢	◢			
Calif. Inst. of Tech., Pasadena, Calif.	◢							◢		◢	◢			◢			◢			◢		◢								◢
Calif. Poly. Sch., San Luis Obispo, Calif.			3					◢		◢	◢	◢	◢	◢	◢	◢	◢	◢	◢	◢		◢			◢	◢	◢			
Fresno State Col., Fresno, Calif.				◢	◢							◢		◢						◢						◢	◢			
Grant Tech. Col., N. Sacramento, Calif.				◢	◢			◢		◢		◢								◢						◢	◢			
Humboldt State Col., Arcata, Calif.				◢	◢																					◢	◢			
Occidental Col., Los Angeles, Calif.												◢								◢										
Pomona Jr. Col., Pomona, Calif.				◢				◢		◢	◢	◢		◢			◢			◢						◢	◢			
Porterville Jr. Col., Porterville, Calif.	◢			◢				◢		◢	◢	◢		◢			◢			◢		◢				◢	◢			
Riverside Col., Riverside, Calif.				◢	◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Sacramento Col., Sacramento, Calif.			4	◢	◢	◢	◢	◢		◢	◢	◢		◢			◢			◢		◢				◢	◢			
San Jose State Col., San Jose, Calif.	◢		5					◢		◢	◢	◢		◢			◢			◢		◢				◢	◢			
Santa Rosa Jr. Col., Santa Rosa, Calif.				◢	◢			◢		◢	◢	◢		◢			◢			◢						◢	◢			
Stanford U., Stanford Univ., Calif.	◢							◢		◢	◢	◢		◢			◢			◢						◢	◢			
Stockton Jr. Col., Stockton, Calif.				◢	◢	◢	◢																							
U. of Calif., Santa Barbara, Calif.			6					◢		◢	◢	◢		◢			◢			◢		◢				◢	◢			
U. of South. Calif., Santa Maria, Calif.	◢			◢	◢	◢	◢	◢		◢	◢	◢		◢			◢			◢		◢				◢	◢			
Colo. A&M Col., Ft. Collins, Colo.				◢	◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Colo. State Col. of Ed., Greeley, Colo.				◢				◢		◢		◢				◢				◢						◢	◢			
Mesa Col., Grand Junction, Colo.				◢																						◢	◢			
U. of Colo., Boulder, Colo.	◢							◢		◢	◢	◢		◢			◢			◢						◢	◢			
U. of Denver, Denver, Colo.	◢			◢	◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Hillyer Jr. Col., Hartford, Conn.	◢																													
Jr. Col. of Conn., Bridgeport, Conn.	◢							◢		◢	◢	◢		◢			◢			◢						◢	◢			

	Degree in airline operations?	Degree in aeronautical engineering?	Degree in other aviation subject?	Courses leading to private license	Courses leading to commercial license	Courses leading to instrument rating	Courses leading to other rating	ADVANCED WORK OFFERED IN: Aerodynamics	Air transportation	Aircraft construction	Aircraft design	Aircraft electricity	Aircraft engines	Aircraft materials	Aircraft mechanics	Aircraft propellers	Aeronautical drafting	Aeronautical physics	Air law and CAR	Airport construction and design	Airport management	Analysis of aircraft structures	Aviation education	Commercial air operations	Flight instruction	Meteorology	Navigation	Radio construction	Wind tunnel operation	Other
McCook Jr. Col., McCook, Neb.				◢	◢			◢		◢		◢																		
U. of Nebraska, Lincoln, Neb.		◢						◢		◢	◢			◢			◢					◢								◢
U. of Omaha, Omaha, Neb.								◢		◢		◢		◢	◢	◢				◢						◢				
Colby Jr. Col., New London, N. H.				◢				◢		◢		◢																		
N. J. State Teach. Col., Upper Montclair, N. J.				◢				◢				◢					◢									◢	◢	◢	◢		
Newark Col. of Eng., Newark, N. J.		◢						◢		◢	◢	◢		◢			◢			◢						◢	◢			
Princeton U., Princeton, N. J.		◢						◢		◢		◢										◢	◢			◢	◢	◢		
New Mexico A&M, State College, N. M.		◢						◢		◢		◢		◢		◢				◢						◢	◢			
U. of New Mexico, Albuquerque, N. Mex.		◢						◢		◢		◢		◢																
Columbia U., New York, N. Y.								◢		◢		◢		◢								◢	◢							
Cornell U., Ithaca, N. Y.		◢						◢		◢	◢	◢		◢			◢			◢						◢	◢			
Guggenheim Sch. Aero., NYU, New York, N.Y.		◢						◢		◢	◢	◢		◢			◢			◢						◢	◢			
Long Is. Ag. & Tech., Farmingdale, N. Y.	11		11 12 13					◢		◢	◢	◢		◢			◢			◢		◢	◢			◢	◢			14
Poly. Inst. Brooklyn, Brooklyn, N. Y.		◢						◢		◢		◢		◢			◢			◢						◢	◢			
Rensselaer Poly. Inst., Troy, N. Y.								◢		◢		◢		◢			◢			◢						◢	◢			
St. Bonaventure Col., St. Bonaventure, N. Y.					◢	◢																								
State Teach. Col., Buffalo, N. Y.								◢		◢		◢		◢			◢			◢						◢	◢			
State Teach. Col., Potsdam, N. Y.								◢		◢		◢														◢	◢			
Ag. & Tech. Col., Greensboro, N. C.																										◢	◢			
Duke U., Durham, N. C.		◢						◢		◢		◢																		
N. Car. State Col., U. of N. C., Raleigh, N. C.		◢						◢																						
Presbyterian Jr. Col., Maxton, N. C.					◢	◢	◢		9	◢	◢	◢		◢			◢									◢	◢			
N. Dak. Ag. Col., Fargo, N. Dak.		◢			◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Bowling Green State U., Bowling Green, O.		◢			◢	◢	◢																							
Case Sch. Applied Sci., Cleveland, O.		◢			◢	◢	◢	◢		◢		◢																		
Denison U., Granville, O.					◢	◢																								
Fenn Col., Cleveland, O.					◢	◢	◢	◢		◢		◢														◢	◢			
Kent State U., Kent, O.	◢				◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Ohio U., Athens, O.					◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			15
Ohio State U., Columbus, O.	◢	◢			◢	◢	◢	◢		◢	◢	◢		◢			◢			◢		◢				◢	◢			
U. of Akron, Akron, O.		◢			◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
U. of Cincinnati, Cincinnati, O.		◢			◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Wilmington Col., Wilmington, O.	11				◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			
Youngstown Col., Youngstown, O.					◢	◢	◢	◢		◢	◢	◢		◢			◢			◢						◢	◢			

U. of Colo., Boulder, Colo.
U. of Denver, Denver, Colo.
Hillyer Jr. Col., Hartford, Conn.
Ohio U., Athens, O.
Ohio State U., Columbus, O.
U. of Akron, Akron, O.
U. of Cincinnati, Cincinnati, O.
Jr. Col. of Conn., Bridgeport, Conn.
J. B. Stetson U., DeLand, Fla.
U. of Fla., Gainesville, Fla.
Ga. Sch. of Tech., Atlanta, Ga.
U. of Georgia, Athens, Ga.
Ricks Col., Rexburg, Idaho
U. of Idaho, Moscow, Idaho
Bradley Poly. Inst., Peoria, Ill.
Ill. Inst. of Tech., Chicago, Ill.
Monmouth Col., Monmouth, Ill.
U. of Ill., Urbana, Ill.
Western Ill. State Teachers Col., Macomb, Ill.
Huntington Col., Huntington, Ind.
Ind. Tech. Col., Ft. Wayne, Ind.
Purdue U., Lafayette, Ind.
Rose Poly. Inst., Terre Haute, Ind.
Tri-State Col., Angola, Ind.
U. of Notre Dame, Notre Dame, Ind.
Buena Vista Col., Storm Lake, Ia.
Drake U., Des Moines, Ia.
Estherville Jr. Col., Estherville, Ia.
Iowa State Col., Ames, Ia.
State U. of Iowa, Iowa City, Ia.
Western Union Col., Le Mars, Ia.
Jr. Col., Arkansas City, Kans.
Kans. State Col., Manhattan, Kans.
Kans. State Teachers Col., Pittsburg, Kans.
U. of Kans., Lawrence, Kans.
Wichita U., Wichita, Kans.
U. of Kentucky, Lexington, Ky.
Ursuline Col., Louisville, Ky.
La. State U., Baton Rouge, La.
Northwestern State Col., Natchitoches, La.
Bowdoin Col., Brunswick, Me.
U. of Maine, Orono, Me.
U. of Baltimore, Baltimore, Md.
Johns Hopkins U., Baltimore, Md.
U. of Maryland, College Park, Md.
Boston U., Boston, Mass.
Mass. Inst. Tech., Cambridge, Mass.
Northeastern U., Boston, Mass.
Williams Col., Williamstown, Mass.
Worcester Poly. Inst., Worcester, Mass.
Cent. Mich. Col. Ed., Mt. Pleasant, Mich.
Ferris Inst., Big Rapids, Mich.
Mich. Col. Mining & Tech., Houghton, Mich.
U. of Detroit, Detroit, Mich.
U. of Mich., Ann Arbor, Mich.
Carleton Col., Northfield, Minn.
Hibbing Jr. Col., Hibbing, Minn.
Itasca Jr. Col., Coleraine, Minn.
U. of Minn., Minneapolis, Minn.
Worthington Jr. Col., Worthington, Minn.
Cent. Missouri State Col., Warrensburg, Mo.
Drury Col., Springfield, Mo.
Hannibal-LaGrange Col., Hannibal, Mo.
Northeast Mo. State Teach., Kirksville, Mo.
Rockhurst Col., Kansas City, Mo.
Stephens Col., Columbia, Mo.
Billings Poly. Inst., Polytechnic, Mont.
Montana State Col., Bozeman, Mont.
Wilmington Col., Wilmington, O.
Youngstown Col., Youngstown, O.
Bacone Col., Bacone, Okla.
Bethany-Peniel Col., Bethany, Okla.
East Central State Col., Ada, Okla.
Langston U., Langston, Okla.
Okla. A&M, Stillwater, Okla.
Okla. Military Acad., Claremore, Okla.
Southeastern State Col., Durant, Okla.
U. of Okla., Norman, Okla.
Oregon State Col., Corvallis, Ore.
U. of Tulsa, Tulsa, Okla.
S. Ore. Col. Educ., Ashland, Ore.
Willamette U., Salem, Ore.
Allegheny Col., Meadville, Pa.
Clarion State Teach. Col., Clarion, Pa.
Drexel Inst. Tech., Philadelphia, Pa.
Lehigh U., Bethlehem, Pa.
Pa. State Col., State College, Pa.
State Teach. Col., Lock Haven, Pa.
Thiel Col., Greenville, Pa.
U. of Pittsburgh, Pittsburgh, Pa.
Brown U., Providence, R. I.
R. I. State Col., Kingston, R. I.
State A&M Col., Orangeburg, S. Car.
U. of S. Car., Columbia, S. Car.
Northern State Teach. Col., Aberdeen, S. Dak.
S. Dak. State Col., Brookings, S. Dak.
E. Tenn. State Col., Johnson City, Tenn.
Fisk U., Nashville, Tenn.
Madison Col., Madison College, Tenn.
Memphis State Col., Memphis, Tenn.
Middle Tenn. State Col., Murfreesboro, Tenn.
Tenn. Poly. Inst., Cookeville, Tenn.
A&M Col. of Tex., College Station, Tex.
E. Tex. State Teach. Col., Commerce, Tex.
Stephen Austin State Col., Nacogdoches, Tex.
Hardin Jr. Col., Wichita Falls, Tex.
Sam Houston State Teach. Col., Huntsville, Tex.
Kilgore Col., Kilgore, Tex.
N. Tex. Ag. Col., Arlington, Tex.
Schreiner Inst., Kerrville, Tex.
Southwest State Col., San Marcos, Tex.
Southwestern U., Georgetown, Tex.
Tex. Christian U., Ft. Worth, Tex.
Tyler Jr. Col., Tyler, Tex.
U. of Texas, Austin, Tex.
Brigham Young U., Provo, Utah
U. of Utah, Salt Lake City, Utah
U. of Virginia, Charlottesville, Va.
Va. Poly. Inst., Blacksburg, Va.
Gonzaga U., Spokane, Wash.
St. Martin's Col., Lacey, Wash.
Seattle Col., Seattle, Wash.
State Col. of Wash., Pullman, Wash.
U. of Wash., Seattle, Wash.
Whitworth Col., Spokane, Wash.
Yakima Valley Jr. Col., Yakima, Wash.
West Virginia U., Morgantown, W. Va.
U. of Wisconsin, Madison, Wis.

[1] Aeronautical administration
[2] Aviation education
[3] Aviation maintenance engineering
[4] Associate of Arts degree: (1) aeronautical technician (2) A&E mechanic (3) pilot and flight operations
[5] Aeronautical management, aircraft mechanic, aircraft engine mechanic
[6] Aero technology
[7] Option of business and economic aspects of air transportation in commerce curriculum
[8] Aeronautical power plants, airport operation and management
[9] Aircraft &/or engine mechanics
[10] Transportation with specialization in air transportation
[11] Two-year degree
[12] Aeronautical secretarial science
[13] Aircraft manufacturing
[14] These courses offered beginning September 1947
[15] Airline hostess, aviation business law
[16] Two year terminal course in aircraft maintenance



Turning toward runway being used for GCA approach, author is in blanked-out cockpit obeying verbal radio instructions of GCA controller. Turn is being made closer to end of runway in use (out of picture to right) than is customary. Turn onto final approach leg usually is made about seven miles from airport, giving blind-flying pilot time to adjust descent.

Search radar antenna used in test.

Blind Landings for the Amateur?

By MAX KARANT

Managing Editor, FLYING

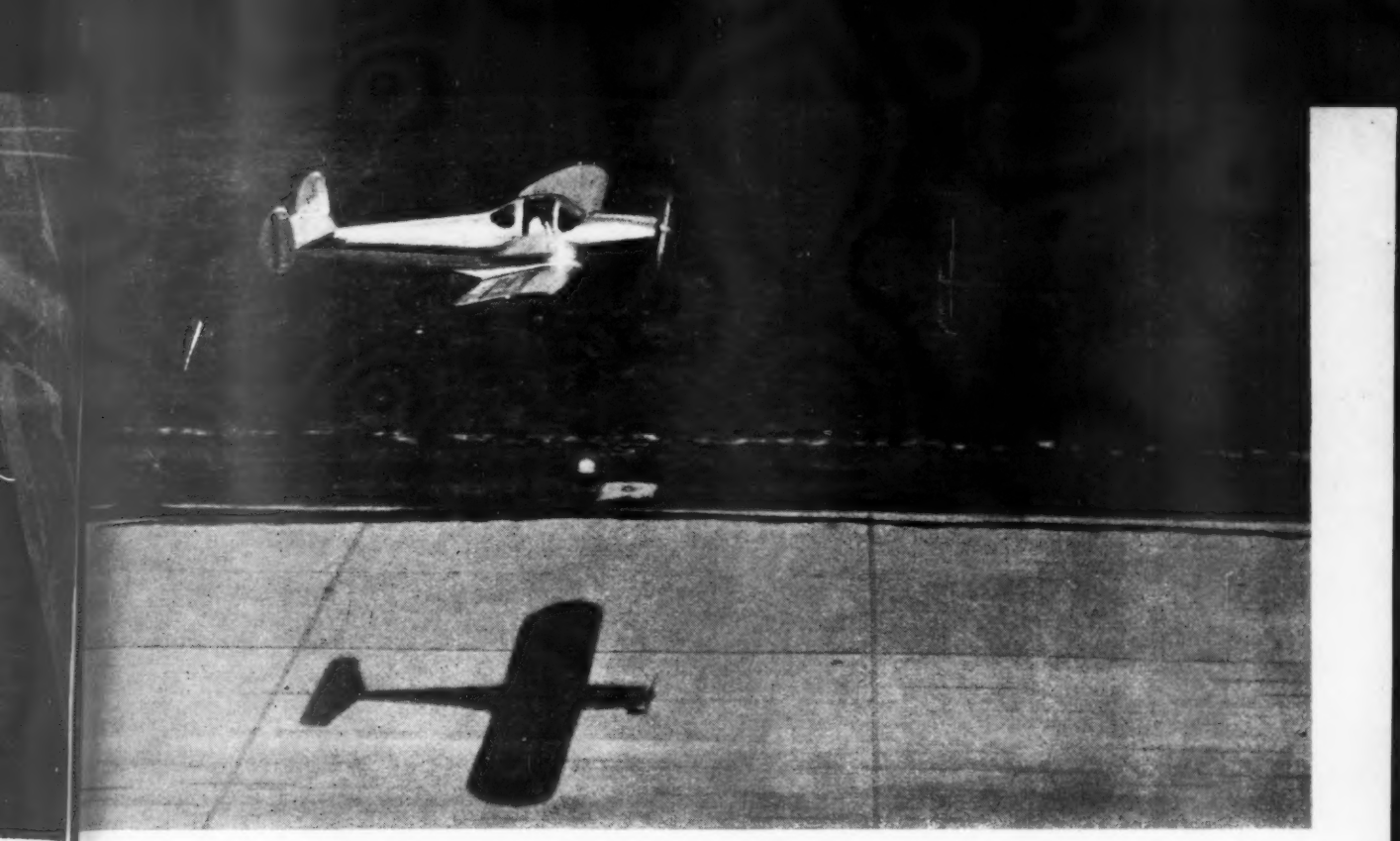
ANY private pilot with 100 solo hours in his log book now can make blind approaches and landings as a matter of course. He can do this in his own little lightplane, and it will only cost him the price of a small radio, a sensitive altimeter, artificial horizon and directional gyro. With that extra equipment in his otherwise standard lightplane, the private pilot today can do the kind of flying no airline pilots have yet done in actual airline operations, and few have done even experimentally.

Ordinarily, such a statement would be brushed off as being crackpot. In this case, however, I say it without hesitation—because I have just done it myself. I have logged relatively few solo hours, yet, without any training whatever, I recently flew a series of blind approaches and landings without any difficulty.

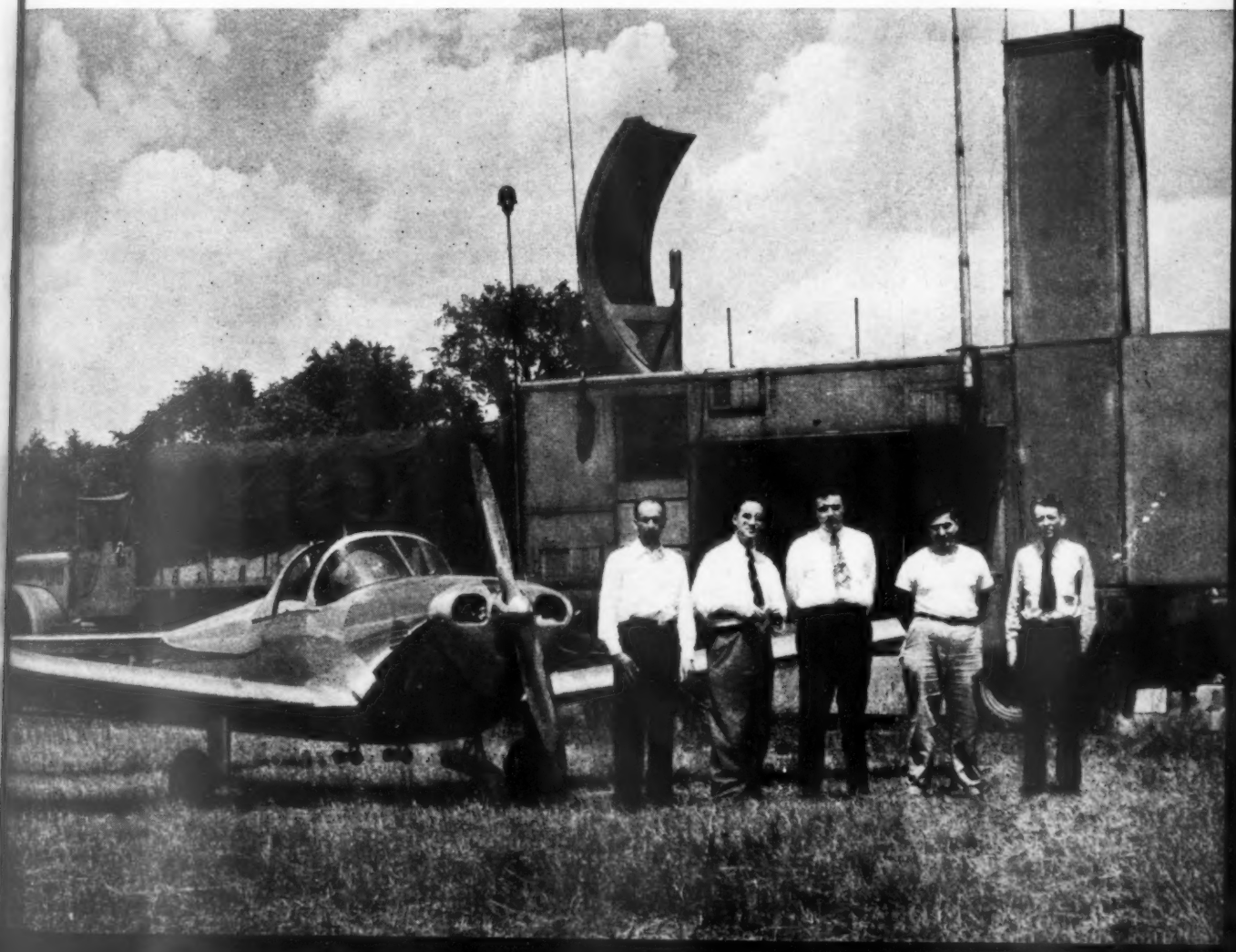
There is still no airline blind-landing system in use, despite the fact that the recent war handed the lines a carefully-developed, well-proved tool that could greatly increase their bad-weather operations: radar. Now by a strange quirk, it may well be the poor, inexperienced private pilot who—with the help of the military air services—becomes the first civilian flyer to use radar in bad-weather flying.

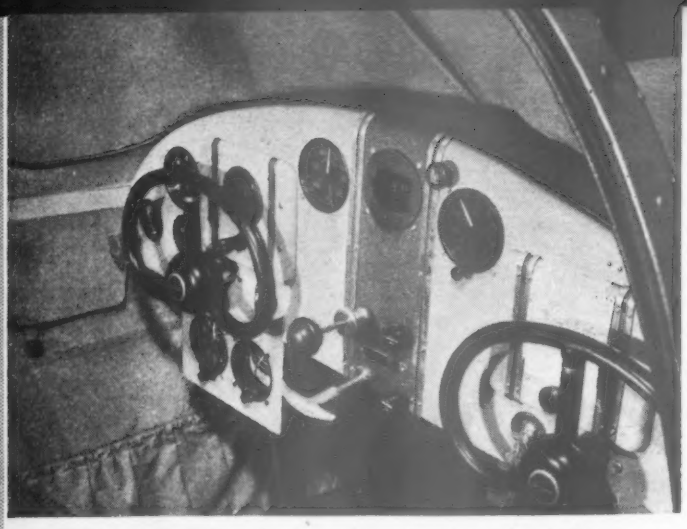
During the last years of the war Army and Navy airmen used and heartily approved a radar blind-approach device called GCA (Ground-Controlled Approach). With this equipment, specially-trained crews on the ground are able to locate and verbally direct a lost airplane right down onto a runway without the pilot being able to see the field until he is on it. GCA is far from a laboratory gadget; many Army and Navy airplanes all around the world were "talked down" by GCA after all their planes' expensive air-borne equipment had failed. [GCA was described in detail in FLYING, April, 1946.]

While the airlines still are working on a complex blind-

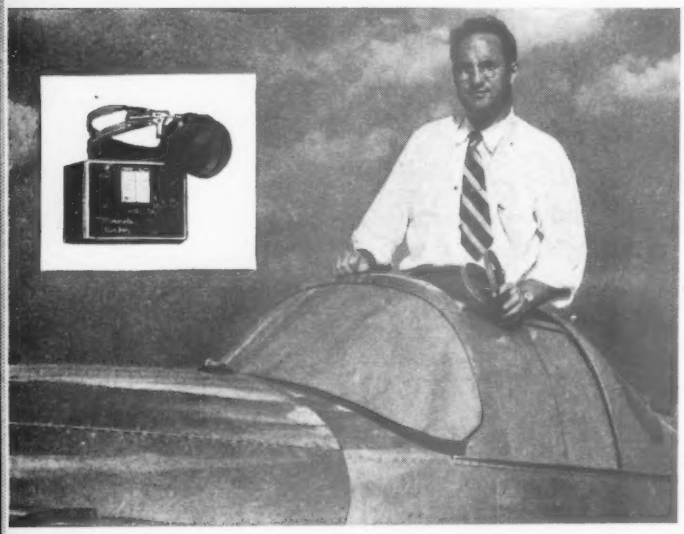


Seconds before actual landing, author is holding plane in shallow glide as GCA controller talks him down onto runway. Check Pilot Zenitz can be seen peering ahead through small spot in windshield. Equipment used in tests is shown below. Left to right are Zenitz, the author, and J. H. Hilton, A. B. Johnson, R. C. Williams, CAA operators of Indianapolis GCA unit.





Special instruments used were sensitive altimeter and attitude gyro (on panel below wheel) and gyro compass (left glove compartment lid).



Visibility was zero from side of cockpit in which author is standing. Tiny four-pound radio receiver (inset) operates on batteries, costs $40.

GCA controllers are shown inside radar trailer as they talked-down author's plane during one problem. Radar scopes are under glass covers.

landing system that will require each plane to carry thousands of dollars worth of elaborate equipment, and their pilots to be super-experts, the Army and Navy have just announced a joint "havens of safety" program based on GCA. Both services already are operating a number of these havens; their program calls for dozens of additional havens. Each will be available to any aircraft wanting to use it—and that's where the private pilot comes in.

Unlike an airline blind-landing system, GCA can be used immediately by any private pilot, with no previous training. His airplane need have only a minimum of equipment—all of it well within his financial reach. If he can understand the GCA controller's simple instructions, and keep his airplane under control, the private pilot can make consistent and safe blind approaches and landings.

One point must be emphasized: the average private pilot should not and will not be permitted to set out on instrument flights cross-country, airline fashion. But if he does start a trip, then gets caught unexpectedly by bad weather, GCA makes it possible for him to do a safe, workmanlike job of getting his little airplane back on the ground without denting it.

Champions of GCA had suggested that possibility for some time. Soon after hearing of the Army-Navy "havens of safety" program, I decided to find out for myself. After talking it over with Army, Navy and CAA men experienced with GCA, it was agreed that I should use a metal lightplane (for best radar reflections) with a tricycle landing gear (for safe mush-down blind landings). The *Ercoupe* filled that specification, although I had some misgivings about the *Ercoupe's* two-control system for that kind of instrument flying. As it later developed, the lack of separate rudder controls had little effect on the flights. As a matter of fact, the plane's spinproof characteristic added a valuable safety factor to the tests.

The use of GCA by lightplanes has been rare. A few approaches and landings were made with an Aeronca and a Stinson some time ago. They proved successful, although the planes' size and fabric-covered structure made it a little difficult for the GCA controllers to keep track of the planes.

It was felt that, in order to do the type of blind flying I wanted, the *Ercoupe* should have three instruments that the average private flyer today does not have: a sensitive altimeter, artificial horizon, and a directional gyro. The *Ercoupe* I was to use (loaned by its manufacturer) had already been equipped with a sensitive altimeter. The Sperry company loaned a directional gyro and one of its new attitude gyros. The latter was selected in preference to a conventional artificial horizon because, unlike the artificial horizon, the attitude gyro will not "tumble" out of control beyond a 40° bank. The attitude gyro was developed for military use and accurately shows the plane's attitude at all times, even though the plane might be on its back or spinning.

One more piece of equipment was needed: a radio. To keep the test equipment simple, I decided to use a tiny (four-pound) battery-operated receiver—the sort of radio equipment the average private pilot might be expected to own. This decision presented the GCA operaters with a new problem: they had always worked aircraft that had transmitters as well as receivers. Now they had to bring in an airplane that could give them no verbal information whatever.

The GCA flights were to be made at Weir Cook Airport, Indianapolis, home of the CAA's big experimental station. A wide variety of civil aviation developments are being tested there, including GCA—although the GCA unit in operation there is an old surplus Army portable set, the 45th that was ever built.

Because the *Ercoupe's* single- (*Continued on page* 68)

Hovering is one of the most difficult jobs of a helicopter pilot. The officer here is climbing into the cockpit by rope ladder during simulated sea rescue in AAF training program.

'Copter College

By JOHN J. SANDUSKI

Formerly Major, Air Corps, in charge of helicopter training

IT SEEMED as if almost every junior pilot in the AAF was bitten by the helicopter bug. The circular announcing that applications for training in the helicopter program would be accepted from flight officers, second and first lieutenants had hardly been distributed when applications began pouring into the Training Command Headquarters at Fort Worth, Tex.

From this mound of applications, specialists selected less than 200 men from the time the program started in March, 1944, until V-J Day. The selection job must have been good, for 180 men were graduated as "egg-beater" pilots and less than 15 were eliminated.

Those chosen faced a strange and entirely new flying course for themselves as well as for the AAF. In other aircraft they would have faced a courts martial for flying low. Now they were to be taught to fly not only low but backwards, sideways, straight up and what have you?

First helicopter deliveries were slow and the program could go no faster than the delivery of new craft. There was no point in training pilots to fly 'copters and then send them to stations where there weren't any.

With six officers and 11 airplane (Continued on page 88)

The author, (right, with Maj. Gen. Frank E. Lowe), the only non-rated officer to learn to fly helicopters.

Instrument panel of Sikorsky R-6 helicopter, with the control stick (left) and rudder pedals at far left.

So You Don't Like My Airport!

George Crockett

By GEORGE CROCKETT

Hey, you griping pilots. Here's an airport operator who talks back.

"No gashline, huh? It's thish kinda thing that's hurtin' aviashun."

"Haw! Haw! Proppin' all that time and I ain't even got the gas on."

THE PILOT and his friend were quite drunk—in fact they were plastered.

They had landed at the airport which I own and operate—Alamo Airport, Las Vegas, Nev.—the night before. Their "recreation" had lasted until the fag end of the morning and apparently they had, without sleeping, started all over again. Still in a convivial mood, they had decided to fly back to Los Angeles over some of the most desolate and mountainous territory in the country, with a 60 m.p.h. wind blowing at the time.

An airport operator has no authority in such a case.

The situation called for extreme tact. My airport manager (a veteran pilot) and I spent half an hour claiming we had no gasoline and trying to get them back into Las Vegas and to bed. When we found that we couldn't change their minds we resorted to fanciful weather reports. Finally, we reported zero-zero at Los Angeles and they decided to sleep it off.

Sober, they finally took off and had a successful trip.

This is hardly an isolated case of what the post-war airport manager faces. It is why we grow gray early. The men were out of line, worried us, and wasted three hours of valuable time out of our usual strenuous 18-hour day.

There has been considerable griping about operators, their lack of service, their "tobacco road" airports. I understand this indictment and I admit that operators have many shortcomings which must be overcome if the current flying boom is to last.

But the flyer must co-operate! Little or nothing has been said about that.

We need etiquette on airports. There is no excuse for some of the things pilots do. I believe my observations are qualified because I have spent years as a flyer, factory representative, an air-travelling salesman, and as operator of an airport. Here's a sample of what I mean:

Not long ago, just as I was about to have lunch in my cafe—it is clean and inviting and capably managed, incidentally—two men flew in and wanted to go into Las Vegas, five miles away. I told them to take my car without charge. Fifteen minutes after they had gone I received a telephone call:

"Hey, one of your tires blew out! Get somebody down here to fix it."

I found where the car was and I pulled two A & Es—my entire force—off a rush job and sent them into the city in another car to make repairs, which took an hour. My guests went about their business, returned to the field, climbed into their airplane and zipped away without so much as a thank you, and I returned to a cold lunch. Under these circumstances an operator thinks twice about lending his car a second time. (*Continued on page* 76)

"So what? I pay the guy eight bucks an hour for my flyin' time, don't I?"

"Ceiling 50—squalls—we've hit worse, ain't we, Joe?"

The 'Bread and Butter' Planes

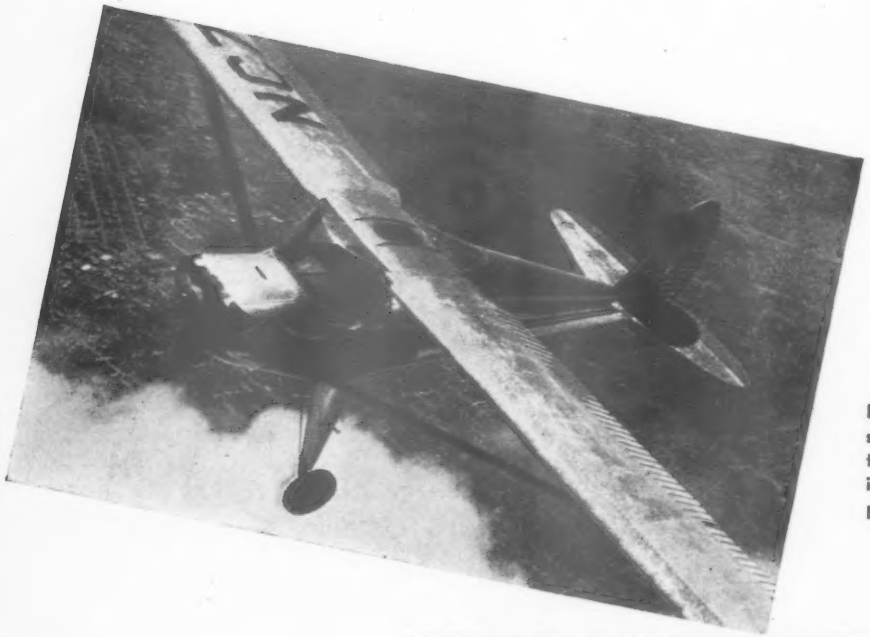
THE five planes pictured on these two pages are the workhorses of the airports. Occasionally some other planes are used for training—like the *Ercoupe* for pilots who want to learn to fly two-control planes—but for conventional aircraft it's the Aeronca *Champion*, Cessna 120, Luscombe *Silvaire*, Piper *Cub* and Taylorcraft which provide the steady airport incomes.

Except for the Cessna 120, which has an 85-h.p. engine, these planes have virtually the same 65-h.p. power plant. Three carry two persons side-by-side. The *Champion* and *Cub Trainer* are tandems. They are all stripped-down planes designed for flying around airports and little more. They range in cruising speed from the 100-plus m.p.h. of the Cessna to the 73 m.p.h. of the *Cub*, and in fly-away cost from $2,195 for the *Cub* to $2,995 for the Luscombe. They are the lowest-priced planes in America.

They vary in construction detail but all are high-winged, strut-braced monoplanes. All have conventional gear and tail wheels. The Cessna is metal with fabric-covered wings. New Luscombe models are all-metal, though past models have had fabric wings. The other three trainers are fabric-covered.

And they do pay off. A survey of operators in the Chicago area revealed that operation costs based on a 720-hour flying year averaged only $3.40 per hour. This cost includes depreciation over a five-year period, routine maintenance, gas, oil, insurance, and the 500-hour major overhaul. It does not include hangaring, or salaries of airport personnel, or taxes. Today, however, planes are flying a great deal more than 720 hours a year and the operation costs are correspondingly less because fixed charges are written off in the first 720 hours of use.

Rental rates in the Chicago area averaged about $7.50 per solo hour—leaving $4.10 for field and personnel costs and profit. And there is a profit. Operators are clamoring for more and more planes of this type. They know the "bread and butter" value of lightplane workhorses. END



Luscombe Silvaire has 35-foot wing span, cruises at 105 m.p.h. and has a top speed of 115 m.p.h. Cruising range is 400 miles. Newer models, such as pictured here, have an all-metal wing.

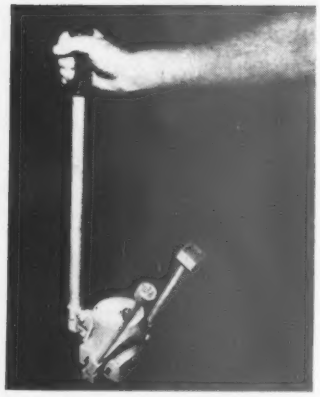
Taylorcraft two-place side-by-side trainer has 36-foot wing span, a maximum speed of 105 m.p.h., cruises at 95 m.p.h., lands at 38 m.p.h. Cruising range is approximately 380 miles.

Aeronca Champion is tandem trainer with wing span of 35 ft. 1¾ in. It has maximum speed of 100 m.p.h., cruises at 90 m.p.h., has range of 270 miles. Rate of climb is 500 f.p.m.

Piper Cub Trainer has 35 ft. 2½ in. wing span, maximum speed of 83 m.p.h., cruising speed of 73 m.p.h. Range is 206 miles. It probably has trained more students to fly than any other airplane.

Cessna 120 has 85-h.p. Continental engine giving it maximum speed over 120 m.p.h. and cruising speed over 100 m.p.h. It is a stripped-down counterpart of the Cessna 140; its range is over 400 miles.

THE *Seabee*

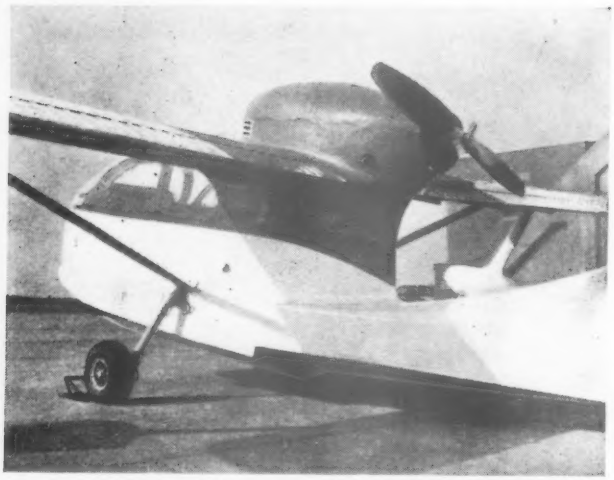


Hydraulic pump works gear and flaps. Small handles are selector valves for each unit.

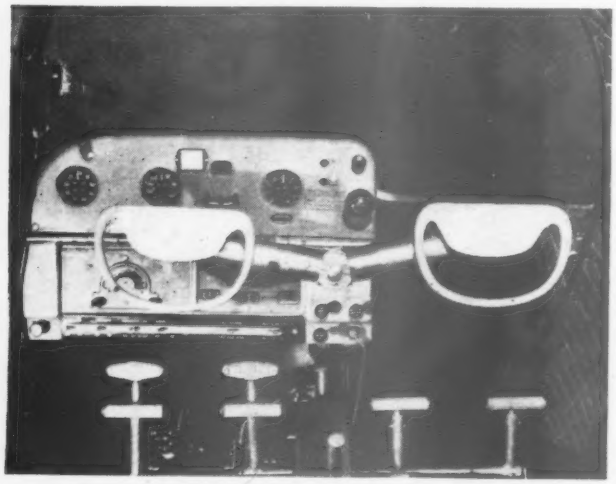
FLYING's CHECK PILOT

EDITOR'S NOTE

This series of articles is planned to help the pilot and prospective plane owner evaluate aircraft now on the market. Only aircraft holding a CAA Approved Type Certificate are flown. The author is not a professional test pilot. He evaluates each aircraft through the eyes of an average private pilot who flies an airplane for business or sport.



Reversible propeller makes water handling of Seabee easier, but costs $350 extra. Cap on hull under wing is on 75-gallon fuel tank.



Instrument layout is simple and efficient. Wheel on right can be removed. Large door and platform for fishing are on right side.

THE most expectant group of would-be plane owners in the United States can now exhale: the Republic *Seabee* has been granted Approved Type Certificate No. 769 by the CAA and is going into production. No private airplane in recent years has had so much of a build-up for so long. The *Seabee* was announced in the summer of 1944. The prototype was first flown in December, 1944. Hundreds of pages of advertising and publicity have been showered on the design since. But all the advance hoopla has contributed materially to the war of nerves that has been waged against would-be *Seabee* owners for the past two years.

Some *Seabee* owners may feel a bit let down once they get their airplanes, because of the incessant fanfare. The air of mysticism surrounding the airplane is justified only by the revolutionary manner in which the airplane was engineered for production. (FLYING, July, 1946), and by the price: $4,495 f.a.f. Farmingdale. But the airplane itself is simply a good, clean, rugged amphibian—nothing extraordinary, certainly nothing fantastic about it.

Like any amphibian, the *Seabee* is the best compromise Republic's engineers could make and still have the airplane they wanted. It is slow (102 m.p.h. cruising speed at 75 per cent horsepower), requires a 215-h.p. engine to get that, will honestly carry four people, and doesn't have any serious built-in bad habits. In other words, the *Seabee* is simply a good, sound, conventional amphibian. But the most revolutionary thing about the *Seabee*—the fact that the finished airplane can be produced in 200 manhours—is something that already is giving the private-plane industry a competitive headache. However, the flying public has yet to give the airplane a thorough going-over— (*Continued on page* 98)

→

Flying over water, the Seabee is at its best. It should be a popular plane with sportsman flyers and seaplane operators. As an amphibian it can get into airports for fuel, repairs, passengers.

NC 87451
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Wing with a Future

By EDWARD A. STALKER

Stalker Development Company, Bay City, Mich.

AERODYNAMICS is a long and somewhat scary word to most people. But it is extremely important to airplanes. Personal aircraft have been in an aeronautical rut for a good many years. But right now a development is underway which can revolutionize them.

This improvement has been tinkered with for 20 years but was not seriously worked on until World War II. Now it has reached the point where it will improve the entire performance of aircraft. It will make flying cheaper and safer. It is called "boundary layer control."

Here in a single development is a solution to a half dozen problems plaguing aircraft designers. Hitherto, these designers have piled gadget upon gadget to achieve a piecemeal solution to their problems. But all these problems are tied together in the boundary layer of air sliding over the wing. Solve one and you solve them all.

Here are some of the gains inherent in boundary layer control:

1. Increase of lift.
2. Reduction of drag.
3. De-icing.
4. Positive lateral control at all times, and the end of spins.
5. Compactness and ruggedness of design.

Boundary layer control is the control of the layer of retarded air which forms on a wing or other surface exposed to the flow of air. When air flows past a wing, a thin layer of that air is greatly slowed by friction with the wing surface. This retarded layer begins on the leading edge of the wing and increases gradually in thickness toward the trailing edge. At small angles of attack it may be only an inch thick at its maximum. But even such a thin layer greatly decreases lift and general efficiency of the wing.

The first boundary layer control in airplanes was the result of an accident. That was the Handley-Page discovery that a slot cut through a wing from bottom to top would increase maximum lifting capacity. But it was still several years before the connection of the slot with the boundary layer was established. Actually, what the slot did was to provide a jet to speed up the boundary layer on the upper surface of the wing.

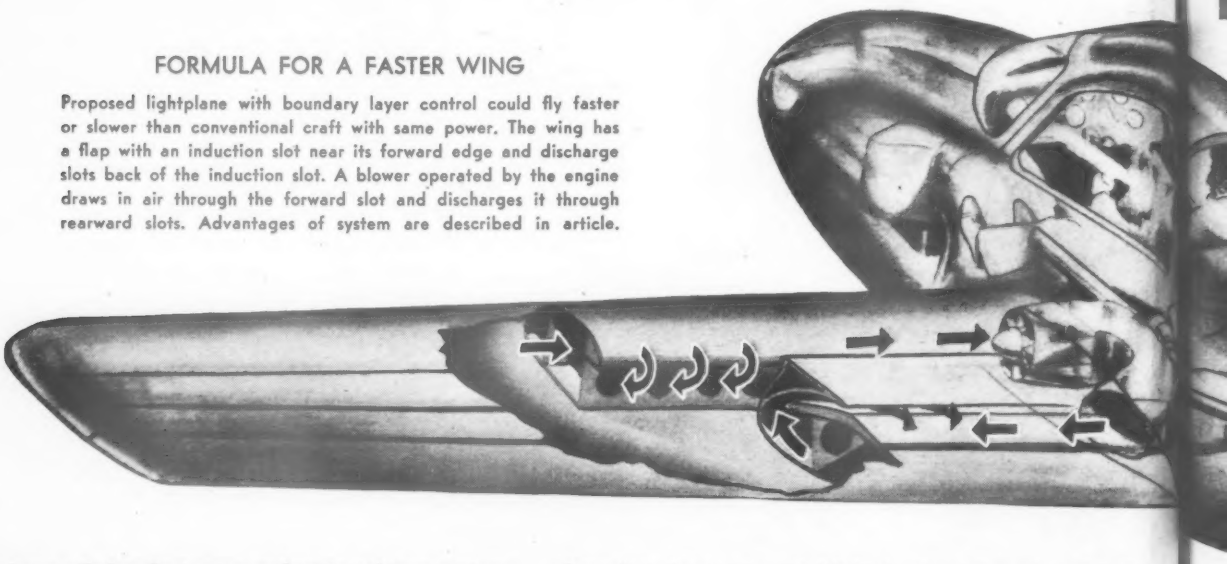
In order to understand a little more about how the boundary layer acts, let's follow the flow of air over a wing.

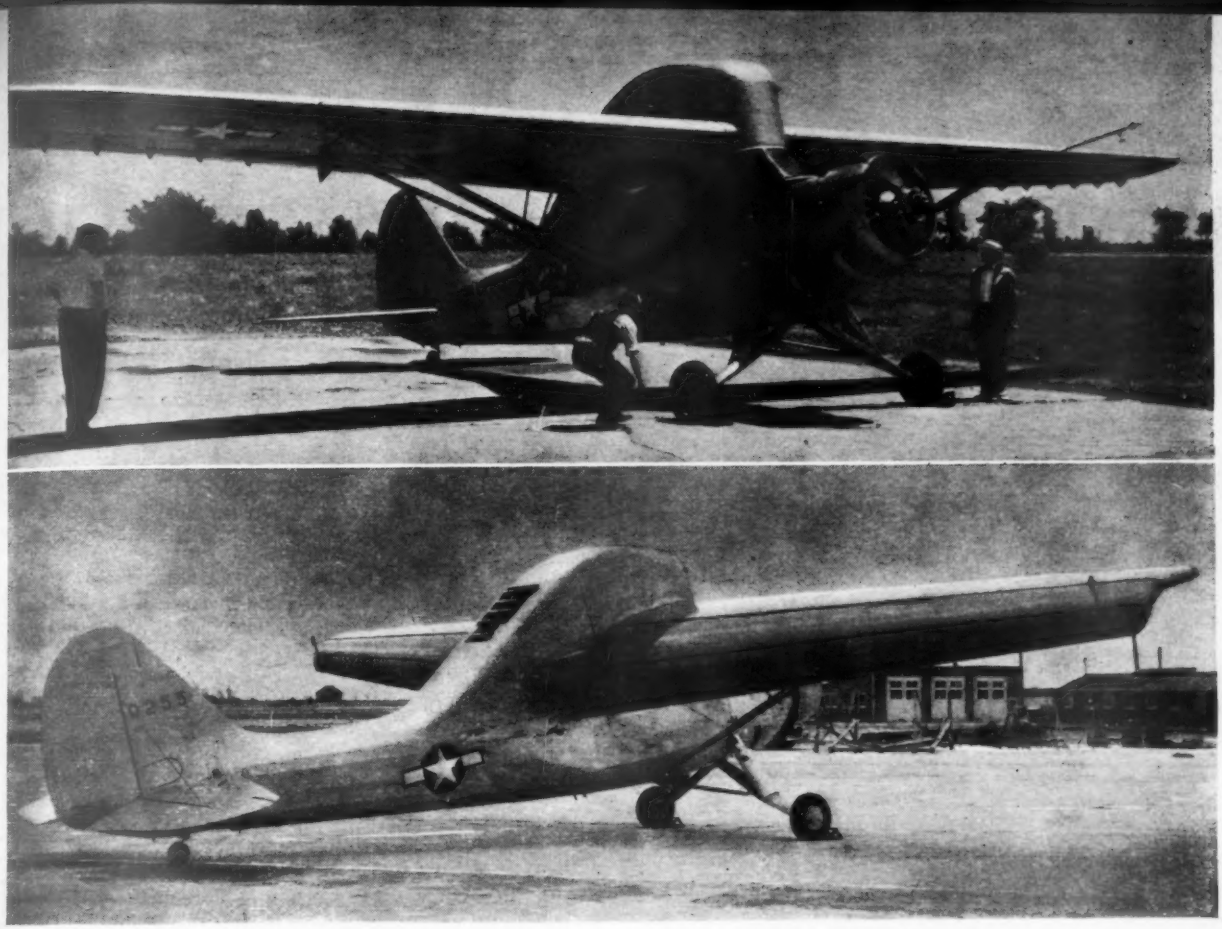
There are two movements of air over a wing. First, there is the massive flow caused by the motion of the plane through the air—with this we are all familiar. But there is a second and opposite flow with which we are not so familiar. This second flow is caused by a great suction which exists near the nose of the wing. It tends to suck particles of air forward even while the great mass of air is moving backward over the wing.

Most of the particles which (*Continued on page* 60)

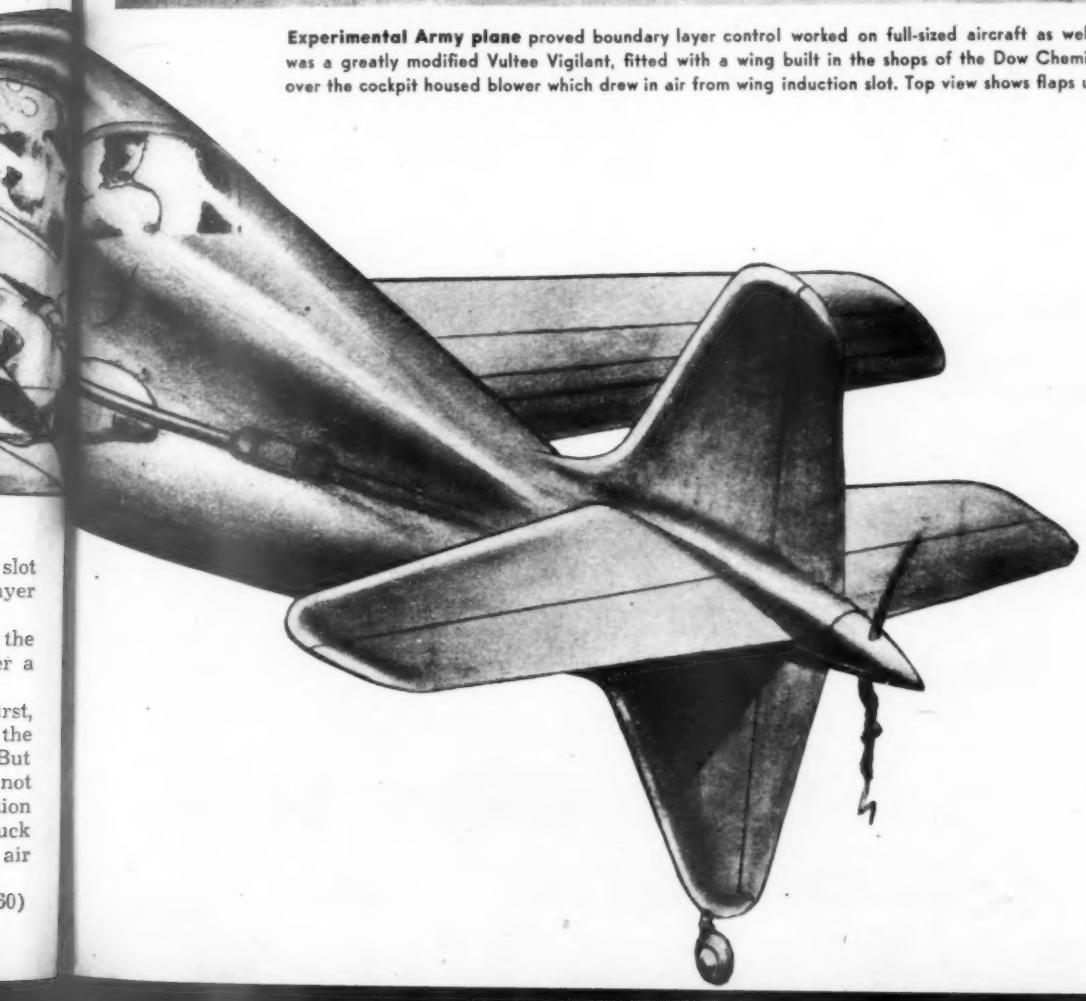
FORMULA FOR A FASTER WING

Proposed lightplane with boundary layer control could fly faster or slower than conventional craft with same power. The wing has a flap with an induction slot near its forward edge and discharge slots back of the induction slot. A blower operated by the engine draws in air through the forward slot and discharges it through rearward slots. Advantages of system are described in article.





Experimental Army plane proved boundary layer control worked on full-sized aircraft as well as on models. This was a greatly modified Vultee Vigilant, fitted with a wing built in the shops of the Dow Chemical Co. The "hump" over the cockpit housed blower which drew in air from wing induction slot. Top view shows flaps up; lower, flaps down.



LONDON LETTER

By Maj. OLIVER STEWART

British Authority, Editor of Aeronautics

ONE of the obstacles to personal flying in Britain is the shortage of places to which one can fly. However, the French air rallies are starting again and are attracting large numbers of Britain's aircraft owners.

The Deauville rally held in July brought together a larger number of personal aircraft than has any other event since the war. About 50 were originally listed, some privately owned, some chartered. For a member of the Royal Aero Club a seat in a charter plane cost $64 and this fee incuded hotel charges.

British flyers were almost equally interested in the seventh Rally of the *Grands Vins de Touraine* which was held earlier in the month. Chief attraction was the visit to the wine vaults where visitors are invited to taste fine vintages.

There is no doubt that rallies on the continent of Europe, and especially in France where they know how to do these things, provide a powerful stimulus to British personal flying as well as throughout Western Europe.

Make It Yourself

This French revival of rallies also is helping to encourage lightplane development. There is real effort in France to find out how to get prices down to something large numbers of people can afford. The Morane-Saulnier M.S. 660 is an example.

The cost is about $900, three quarters of that amount being for the four-cylinder, 50-h.p. Train engine. The aircraft is bought unassembled and it is estimated that it can be put together by a competent amateur in 300 hours. It is a single seat parasol monoplane with a span of 23 ft. 6½ in. Duralumin tubing, wood, fabric and piano wire are the chief materials. Top speed is 100 m.p.h. and range is 300 miles.

Some of the French lightplanes go up from this ultra-simple model to very elaborate designs. The S.E. 2100 is an example of the more advanced aircraft. It is a tailless plane with markedly swept back wings and a 140-h.p. Renault *Bengali* engine. The letters "S.E.," by the way, stand for Sud-Est and refer to the state aircraft constructing company. Morane-Saulnier is not a state concern but is in the direct line of the company that began building aircraft in 1911. Robert Morane is still in charge.

Speed Record

When Britain set the world speed record of 606 m.p.h. in November, 1945, it was thought over here that the United States would make an attempt to beat it. Although no such attempt has materialized up to this writing, Britain will go out to improve the existing figure before the end of the summer.

A site for a new course has been under consideration. In November the course was over the sea off the small town of Herne Bay, in the Thames estuary. This time the course will be off the south coast, near the much larger towns of Bognor and Littlehampton.

Long piers stretching out into the sea are an advantage for helping to mark the beginning and end of the three-kilometers (1.7 miles) run and such piers are available near Bognor.

As for the aircraft, it is likely again to be a Gloster *Meteor* though the jet engines (*Continued on page* 74)

Tail jet replaces vertical rotor on the Cierva Weir-9, British experimental helicopter. Gypsy Queen engine's fan and exhaust supply impulse for the laterally-directed jets. Rudder pedals control direction by varying amount of this exhaust discharge.

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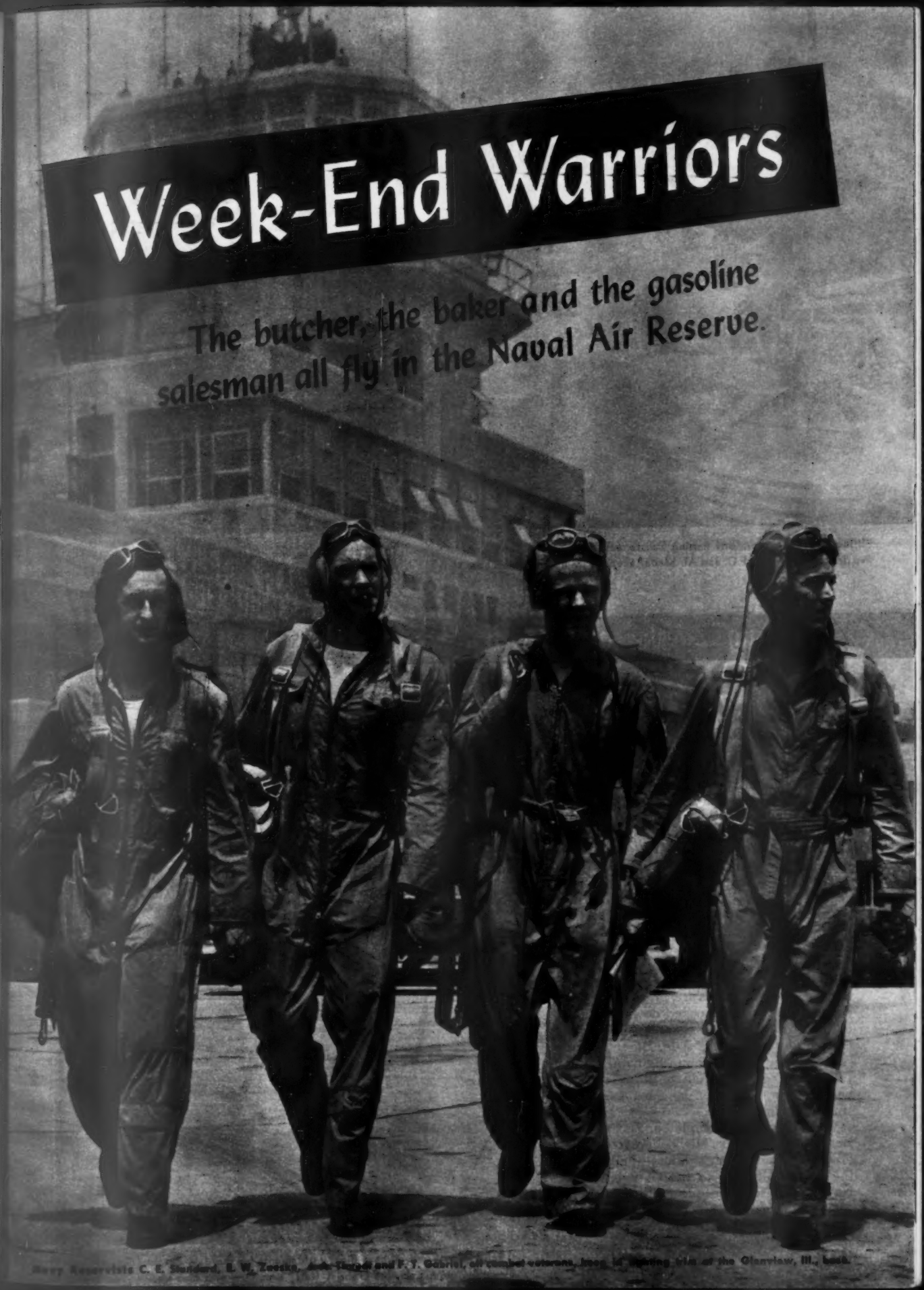

Week-End Warriors
The butcher, the baker and the gasoline salesman all fly in the Naval Air Reserve.

Filling Station Attendant Earling Zaeske was Navy fighter pilot, got five Jap planes, won D.F.C. and Air Medal, keeps in training on weekends.

The Zaeskes—Earling, Bereath and Michael—live in Highland Park, Ill. Mike stays with grandmother when parents go to air base.

Earling Zaeske and his buddies are typical USNR pilots—

FROM office, factory and farm they come rolling in to 21 selected Navy air bases each week-end—the 27,700 men of the Navy Air Reserve. Choose any group of them at random; they are average fellows like those who commute to work with you each day. But they are something more, too, for each is an air-combat ace who has volunteered his spare time to keeping up priceless skills learned in World War II.

The men pictured on these pages are typical USNR flyers. There's Earling Zaeske. Born in Oconomowoc, Wis., he attended Iowa State University before the war—took the CPT course there. In all, Zaeske has logged more than 1,000 hours of flying, most of them from decks of the carriers *Hornet* and *Enterprise* in Pacific combat areas. He knocked down five Jap planes to win his D.F.C. and Air Medal. Now he lives with his wife, Bereath, and son Michael in suburban Highland Park, Ill., where he works in a filling station pending the time when he can resume his studies at Iowa State.

Workaday week completed, Earling and Bereath provide for Michael's care—usually at grandmother's house—and make the seven-mile trip to the Glenview, Ill., Naval air base. There Bereath enjoys the social and recreational facilities provided for reservists (*Continued on page 9¢*)

Schedule board outlines flight assignments for the day. Zaeske (center) finds his combat group includes Gabriel (left) who flew with him from U.S.S. Enterprise.

Arriving at the Glenview, Ill., base, Earling shows pass. While he flies, Bereath will play golf or bridge with other Navy wives.

Logging in, Zaeske (right) meets other combat veterans, stands next to Lieut. C. E. Standard who won Navy Cross for hit on Jap heavy carrier.

from shop and office, they meet at a Naval air base . . .

Briefing is reminiscent of wartime carrier sessions. Flight Leader Thvedt points out course, explains the forthcoming training flight to his three flying comrades.

Planes assigned by operations, Zaeske mounts wing of a Grumman Hellcat to make careful ground check of plane.

Last-minute check on Zaeske's Hellcat is made by AMM McBride. Veteran mechanic spent nine years with Navy in Pacific, Canal Zone.

Signing checkoff list, Zaeske "accepts" plane in which he'll log two hours of flying. Veteran ground crews keep planes in top condition.

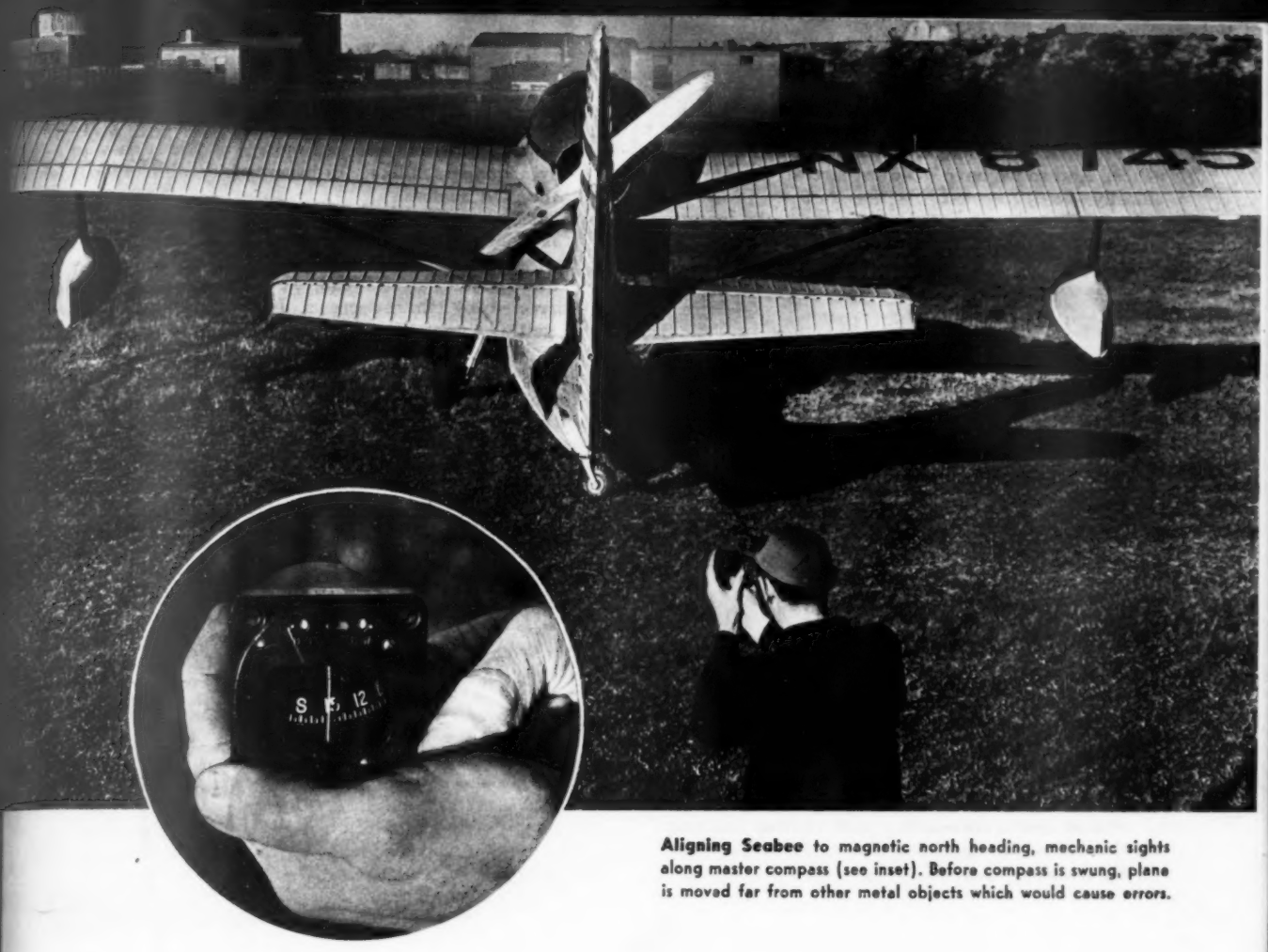
Simulated combat keeps them in top fighting trim.

Earling tees off for round of golf with Bereath. Station's 18-hole course and other recreation facilities are open to reservist families.

Relaxing after flying stint, reservists and their wives (Zaeskes are at right) meet at officers club for cocktails, dinner, dancing.

Helldiver flown by Thvedt leads echelon formation. Hellcats are flown by Zaeske (center) and Standard. Navy estimates that varied training sessions if prescribes will ready each reservist for transition to actual combat operations in from 10 to 30 days.

Compass error of eight degrees east is removed by turning set screw on instrument with brass screw driver. The Republic Seabee below is having compass swung on a concrete compass rose. The use of the rose eliminates need for master compass when making compass corrections.



Aligning Seabee to magnetic north heading, mechanic sights along master compass (see inset). Before compass is swung, plane is moved far from other metal objects which would cause errors.

How To Swing Your Compass

By
A. P. ENGLISH

Adjusting your plane's compass is simple if you follow carefully this easy, step-by-step procedure.

THE compass—that roly-poly thing that tosses around madly in its fluid when you need it most—can be a life-saver or a troublemaker. It is as good as it is accurate.

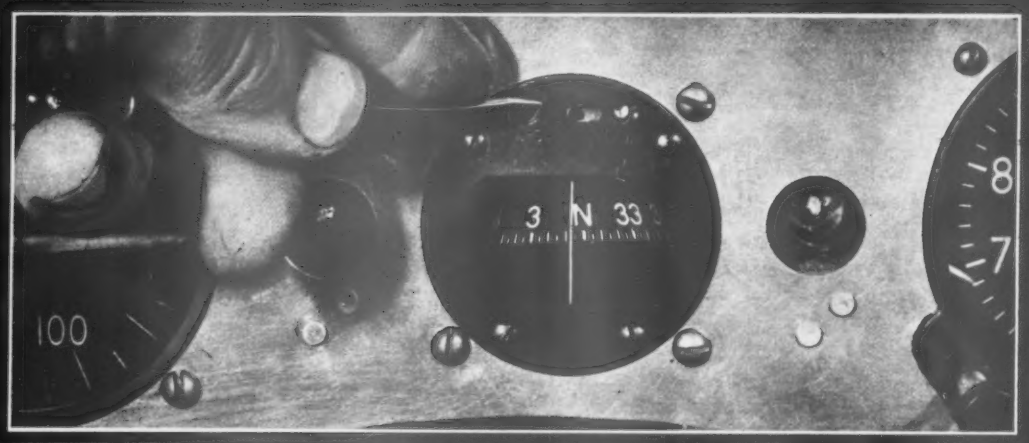
The Sunday pilot who flies around with the airport just off his wing tip hardly ever glances at it. But once he gets away from the airport and starts flying over strange country, his compass becomes important. But again, it is only as good as it is accurate.

Compasses are simple things. Their most important part is a magnetized needle which points to the *magnetic* north pole. It does not, please note, point to the north pole—except in a few areas.

There are local magnetic disturbances which affect the way the compass points, too. These local disturbances, plus the fact that the north pole and the magnetic pole are not in the same spot, unite to give an error called variation.

Nothing can be done about adjusting the compass to correct for variation. The plane navigator simply has to keep it in mind. Variation has been measured throughout the country and pilots can consult a map to find out how much it is at any particular spot. Aeronautical charts have lines connecting points of equal variation. These lines are called isogonic lines. By studying the isogonic lines, the pilot knows how many degrees magnetic north is east or west of true north. With this information, it is a simple matter to look at his compass and calculate his true heading.

But all this, of course, assumes that the compass is accurate. To be accurate, there must be no other influences causing its sensitive needle to point away from magnetic north. Unfortunately, in an airplane there are bound to be such influences. Therefore aircraft compasses must be



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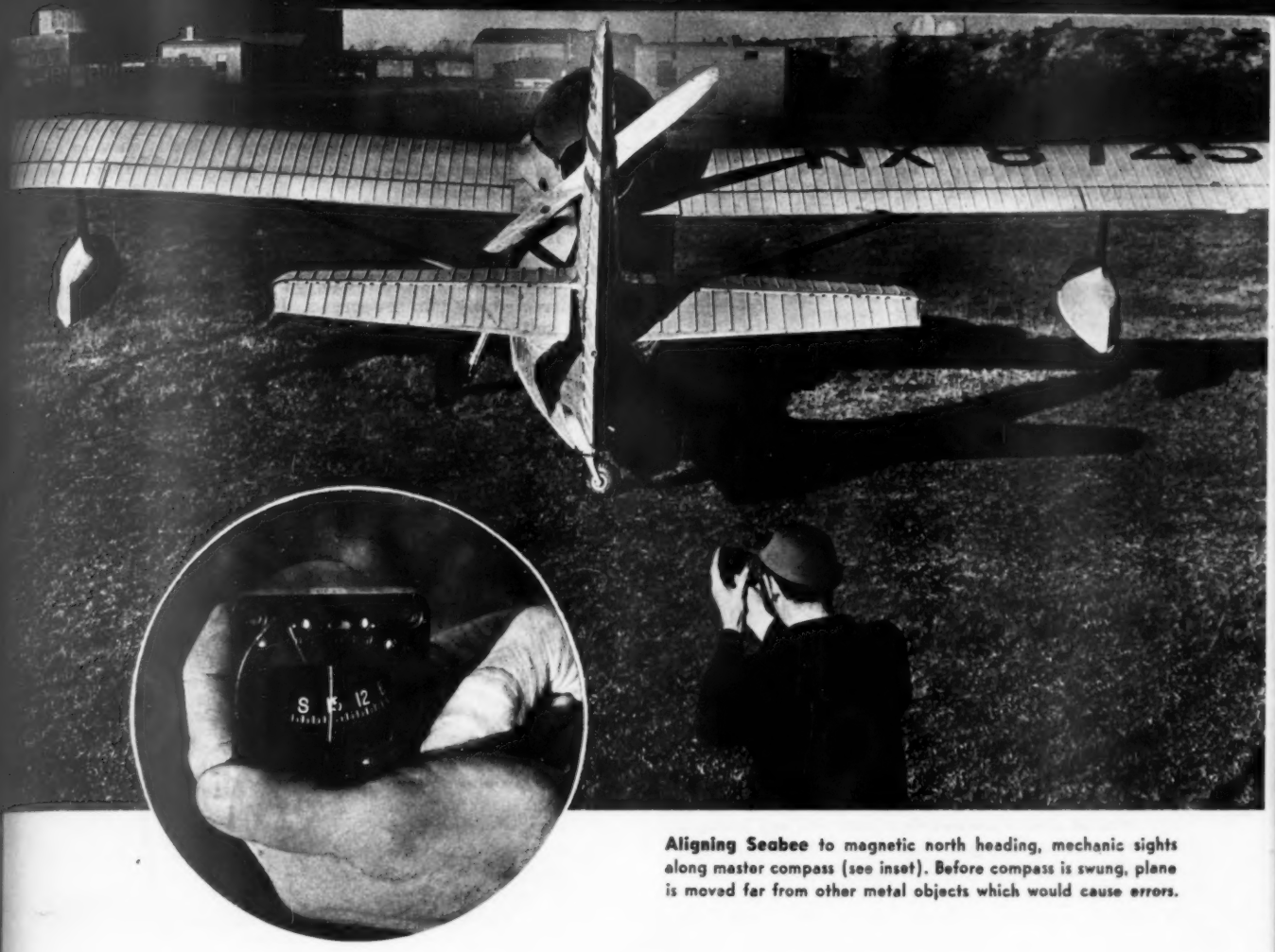

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But all this, of course, assumes that the compass is accurate. To be accurate, there must be no other influences causing its sensitive needle to point away from magnetic north. Unfortunately, in an airplane there are bound to be such influences. Therefore aircraft compasses must be

adjusted to overcome such influences or, at least, the extent of the influences must be measured and known in advance. And so we have to adjust aircraft compasses periodically.

An airplane is composed of non-magnetic materials in large part, but there are bound to be large masses of iron and steel, particularly in the engine, which deflect compass needles. Add to this influence that of the magnetic disturbances of magnetos, generators, ignition wiring, sparks, radio and, possibly, electric motors and it is easy to see why a compass is likely to have considerable error if left to its own devices.

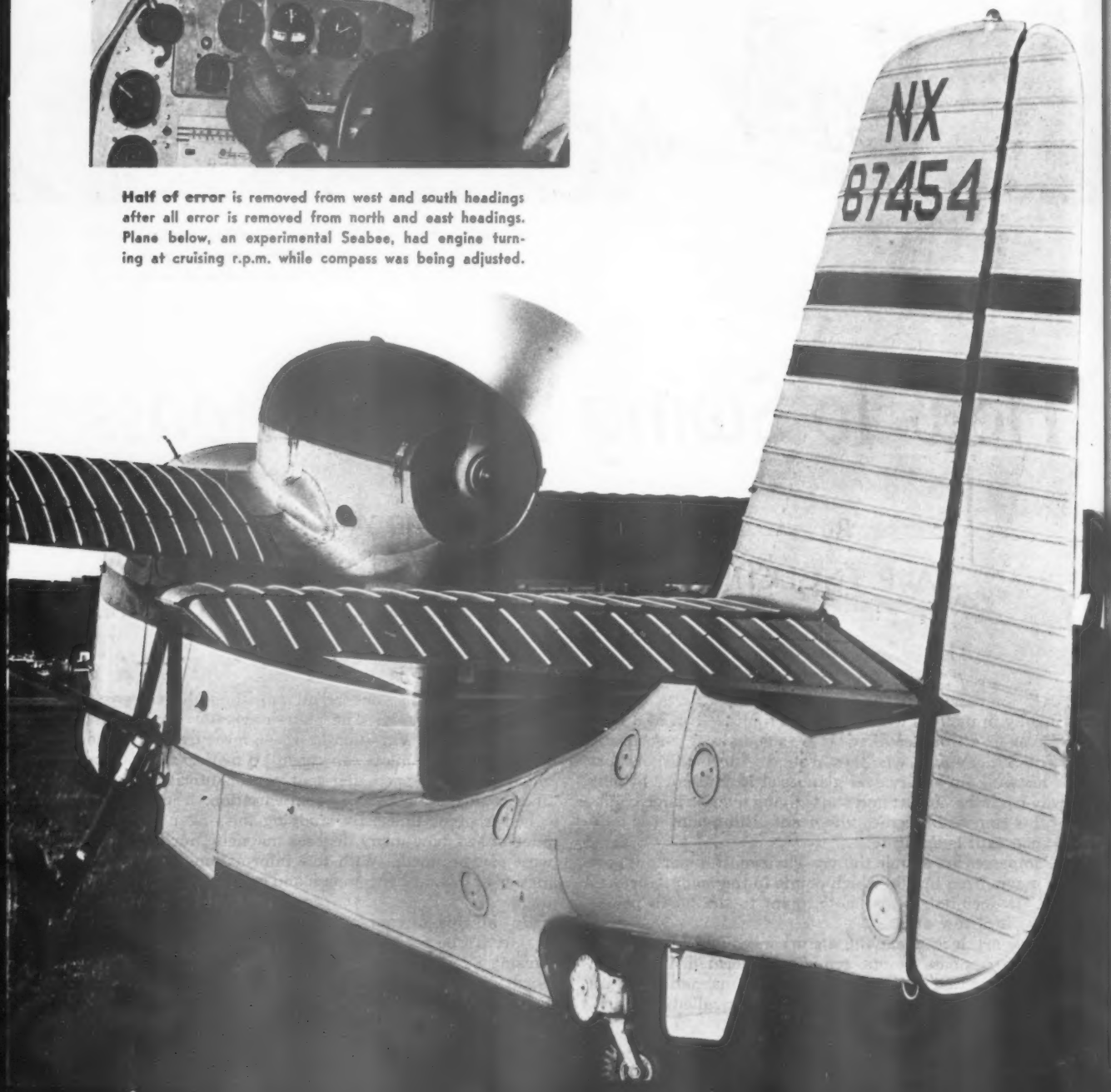
This error is man-made and is called deviation. Because it is man-made, deviation can be corrected in whole or in part.

Most popular aircraft compasses can be compensated, or corrected, by two set screws. In adjusting them our aim is getting them to point to magnetic north.

If an accurate compass rose is on the airport, the problem is much simplified. A compass rose indicates the different true magnetic headings and it is simply a question of lining up the plane on the headings and adjusting the compass. But often there is no compass rose handy.

In this case, taxi the plane out to the far reaches of the airport where the attraction of metal hangars, wires and the like will be at a minimum, (*Continued on page* 92)

Half of error is removed from west and south headings after all error is removed from north and east headings. Plane below, an experimental Seabee, had engine turning at cruising r.p.m. while compass was being adjusted.



REPORT FROM WASHINGTON

By JOHN H. LANCASTER

UNIFICATION'S battle has been fought over and over in Washington, but it took some sharp talking in New York by Lieut. Gen. George E. Stratemeyer to bring it home to many average citizens. General "Strat," as his men call him, spoke pungently: ". . . right now we couldn't punch our way out of a wet paper bag . . . we are in a far more precarious position than we were in 1918 . . . it would be difficult on short notice to put a complete fighter group and B-29 group, as we knew them on V-J Day, into full operative condition in an emergency."

The commanding general of Air Defense Command cited the fact that most of the 400,000 men left in the AAF are untrained for combat. The Bureau of Budget for the fiscal year 1947 has approved 1,359 aircraft for the Navy as against 1,020 for the AAF; has allocated the Navy $385,000,000 to buy more aircraft while the AAF will get only $369,000,000.

"We must unify and have autonomy for air power . . . unhampered by surface thinking of either Army or Navy. As President Truman said in his message to Congress, 'parity for air power can be achieved in one department or in three, but not in two . . . and the former is infinitely preferred' . . . if we get behind the President's proposals, the services would cease to exist as rivals in anything but results. The budget would no longer be a subject for bickering. We would become for the first time the 'Three Musketeers' instead of the 'Three Blind Mice'."

Mustang Jets

In the last days of the German war, our airmen complained of difficulty getting enough speed to fight the Messerschmitt Me-262 jets. The AAF let a contract to the Aerojet Company of Pasadena, Calif., to make JATO units to give our fighters extra thrust for one minute.

Robert Chilton, then engineering test pilot and now in charge of sales for North American's *Navion,* took a *Mustang* up from Los Angeles' Municipal Airport to test the thrust. His equipment included one JATO droppable fuel tank under each wing and one JATO unit in the lower part of the rear fuselage. At 24,000 feet and a true air speed of 429 m. p. h. in straight, level flight, Bob hit the JATO switches. After 59 seconds his speed had been boosted to 513 m. p. h. Joe Barton, another test pilot, flying a P-51F (the fastest of 'em all but never in production) was flying along with Chilton with a wing camera for color shots. When Chilton got through with the added thrust, he was 10 miles ahead of Barton's plane.

The system never reached Europe due to war's end and wasn't needed against the slower Japs.

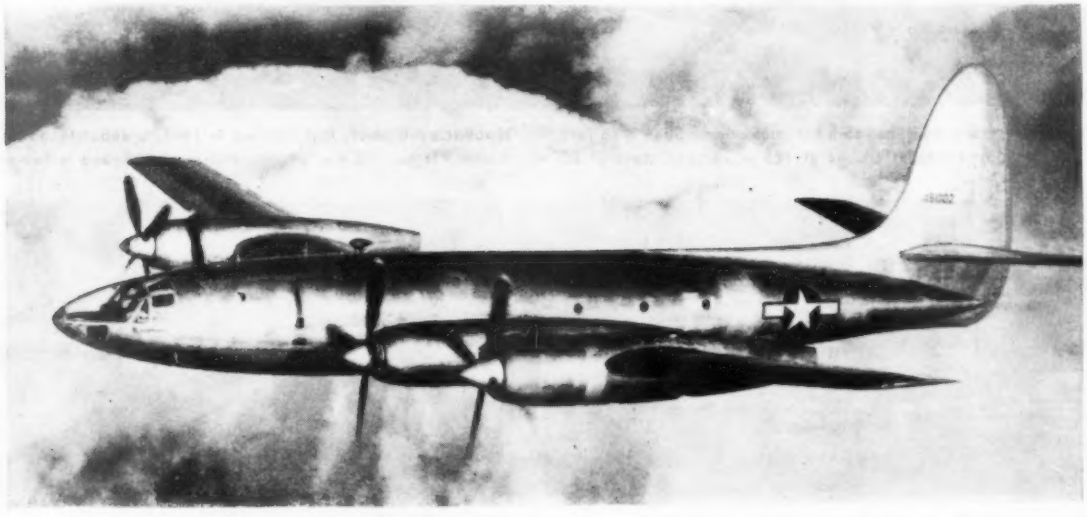
New Global Record?

An attempt to break the three-day, 19-hour world's record flight set by globe-circling Howard Hughes July 10-13, 1938, will be, perhaps, the most newsworthy of a series of important aviation events scheduled for the National Aircraft Show at Cleveland next November.

Unofficial sources have it that the Republic *Rainbow* will be loaned by the AAF for the flight. Its probable route will be Cleveland to New York to London to Istanbul to Calcutta to Tokyo or Shanghai to Seattle to Cleveland. Elapsed time with passengers for this 400 m. p. h. plane with a 4,100-mile range is expected to be about three days. The route would be far longer than that used by Hughes in his speed plane, for he flew over the U. S. S. R. In the event the *Rainbow* is not available, the *Globemaster* (C-74) or a *Constellation* might make the attempt to establish a new record.

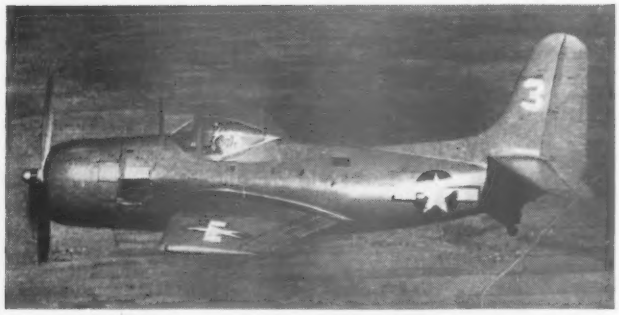
Balkan Block

A difficult international situation is cropping up along Pan American's Balkan route. It may soon become a major issue for the State Depart- (*Continued on page* 86)

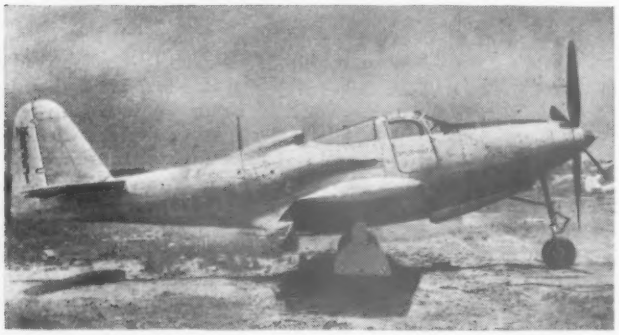


Republic Rainbow may be loaned by AAF for try at new globe-circling record during National Aircraft Show in November.

HAVE YOU SEEN?



Curtiss XBT2C-1, experimental bomber, has 2,500-h.p. engine, two 20-mm. cannon. It carries pilot and one crewman for 1,400-mile range.



Surplus Kingcobra to be flown in Bendix race has four feet cut off wings, weight cut 2,600 pounds. Second P-63 has 13½ feet off wings.

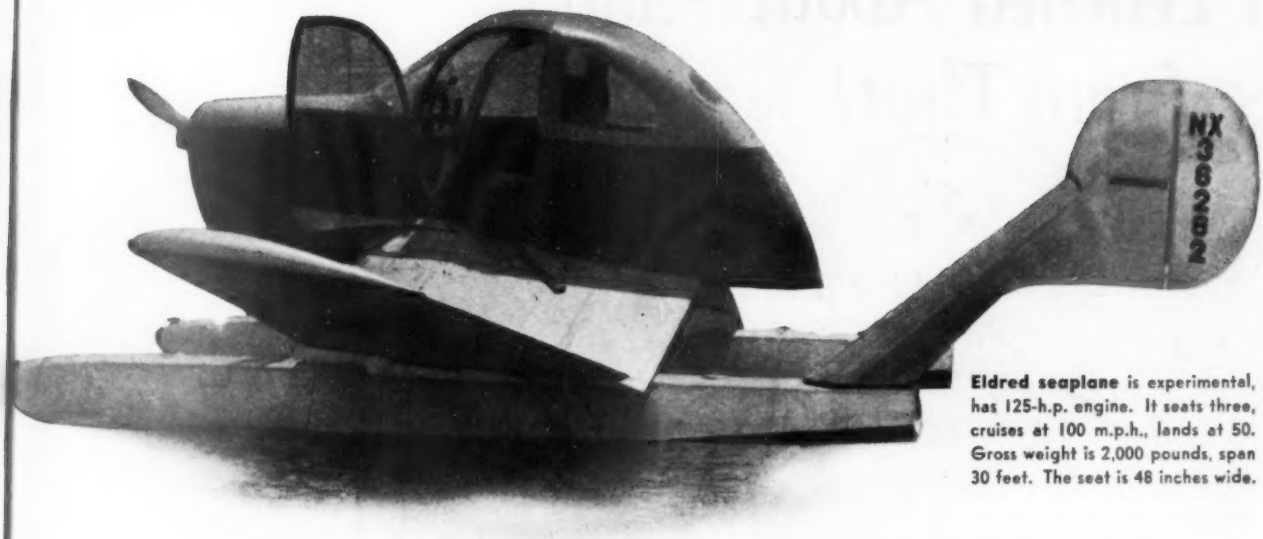
Short Sealand is new six-place British amphibian with two 330-h.p. engines. It cruises at 179 m.p.h. Gross weight: 8,500 pounds.

Retz biplane is home-built, has 65-h.p. radial engine. Span is 16 feet, gross weight 905 pounds. It cruises at 125 m.p.h. and stalls at 55.

Hockaday Comet, first licensed in 1944, is about to go on the market. It has 125-h.p. engine, cruises at 125, and is two-place.

Goodyear amphibian is experimental, has air-cooled pusher engine. It is three-place and is reported to cruise 100 m.p.h. for 350 miles.

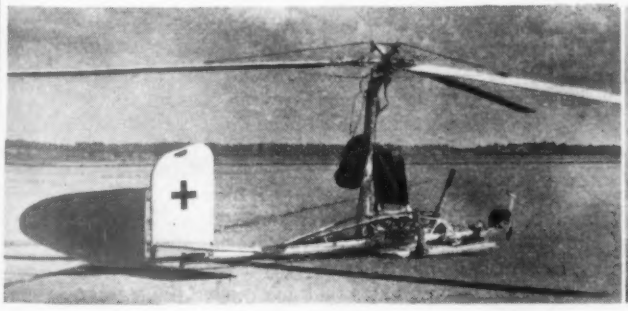
Culver XPQ-15 was experimental radio-controlled target with a 230-h.p. Franklin engine. Top speed was 220 m.p.h. at 20,000 feet.



Eldred seaplane is experimental, has 125-h.p. engine. It seats three, cruises at 100 m.p.h., lands at 50. Gross weight is 2,000 pounds, span 30 feet. The seat is 48 inches wide.

Surplus AT-6, converted by Auburn, Ind., operator, carries two passengers in rear cockpit.

Removable pants for lightplanes have been developed by a Chicago firm. A pair weighs 8½ pounds. Each has 225,000-candlepower light in nose as shown above on a Cessna 140.



German roto-kite helicopter has no engine, was towed 1,000 feet behind submarine for observation work. AAF now is testing it.

Douglas XA-26F is new Invader with jet unit in tail and oversize engines and propellers. Carrying a load it set new record of 413 m.p.h.

I Learned About Flying From That! NO. 83

By
DONALD R. WILLIAMS
Former Army Air Forces Instructor

Into a spin at 10,000 feet and barely out at 100—that happened to an instructor who failed to check his plane before take-off.

THEY claimed that an Army instructor could get his students out of anything, from inverted spins to girl trouble, but after one sunny Texas afternoon which turned into a nightmare of screaming fear, I am inclined to believe that any instructor, regardless of his flying time, at some time or another will get into a situation which requires the help of the Almighty.

I had been "loaned" to another squadron to help in pre-solo flight checks. Due to bad weather the previous week, the entire field was behind on the flight schedule, so everything was rush, rush, rush, to take advantage of the good weather temporarily prevailing. I was assigned three apple-cheeked students and an old, weather-beaten Vultee *Valiant* (BT-13), which I had flown many times before. After a short talk with the students to find out if they all had had the required maneuvers, we hopped a ride down to the plane for the first check.

I hastily scanned Form 1, cursorily inspected the plane, and crawled into the back seat. Soon my first cadet and I were S-ing our way out to the take-off area. I drove the cadet into near hysterics by shutting the gas off, changing the trim-tab, and generally fooling around to check the student's reactions. After a last look at the base leg and a nod from me, the cadet checked the controls for freedom of movement, re-set the trim tabs, and rolled down the runway for take-off. I noticed he seemed to have trouble keeping the plane rolling straight, using almost full rudder for even the smaller corrections, but I chalked it up to nervousness and thought no more about it.

Soon we were at 8,000, cruising around in the warm sunshine, while the student made a few shallow turns to get the feel of the plane. We started out the check with a series of power-on and power-off stalls, which were very poorly performed. Irritated at his lack of technique, I demonstrated a stall, only to find that the trainer was sluggish and gave uncertain reactions to the movement of the controls. It seemed to me as though we weren't getting full movement out of the rudder control, as if the plane was slightly "out of rig."

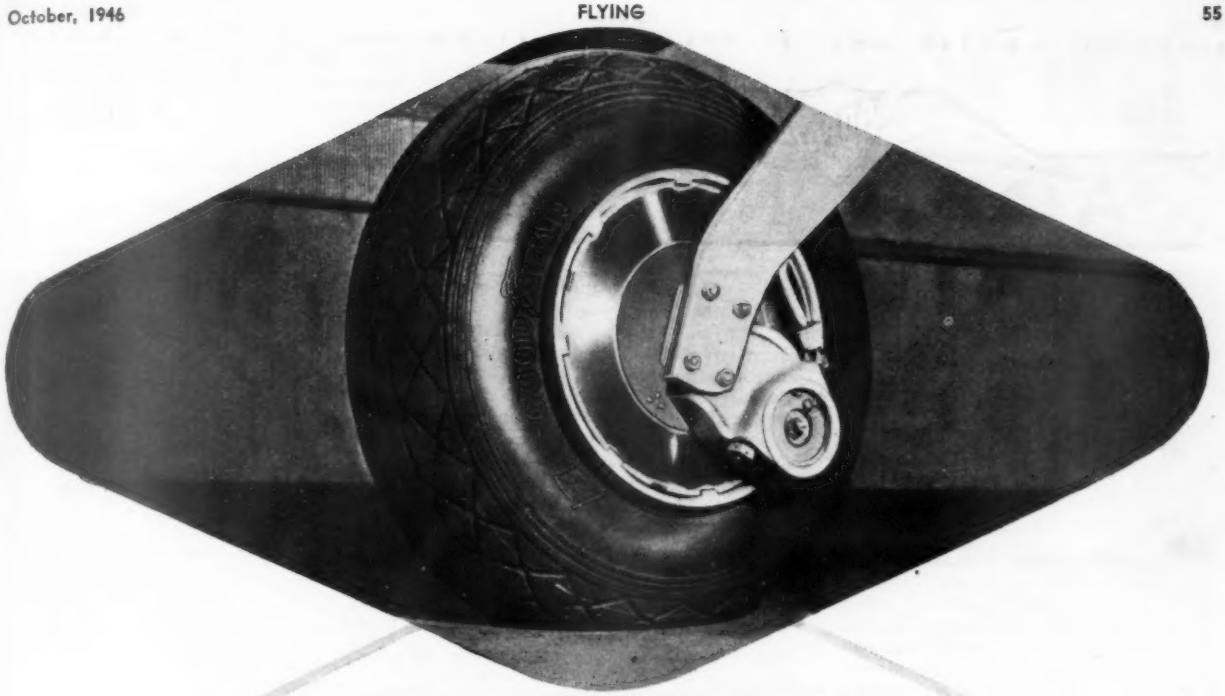
It was a case of going down after another plane and losing very precious time or finishing a check in a plane that couldn't give top performance. I decided to finish the check ride and make allowances for the sluggish controls.

We continued in the check, doing steep turns, co-ordination exercises and gliding turns. Once or twice I had to take over to keep the trainer from going into a spin when the cadet pulled an especially sloppy maneuver. After he had performed most of the maneuvers satisfactorily, I took over and climbed the plane up to 10,000 for the spins. I wiggled the stick and when the cadet indicated that he had it I picked up the inter-com and asked for a two-turn spin. He nodded, started his clearing turns. Then he chopped the throttle, eased the nose up to a stalling attitude. Just as the plane stalled, he tromped hard on the rudder, sucked the stick back into his gut. "Nice entry," I thought to myself, as the nose went down and the wing swept under us.

One turn . . . two turns . . . caustically I informed the student over the inter-com that we didn't have all night, and that two turns were all that was required of him.

The student jumped on the controls. Opposite rudder . . . a slight hesitation, then stick well forward of neutral. It was a good standard recovery. The spin slowed, stopped. Then the *Valiant* started to skid, nose still straight down. Instead of taking over, I cynically allowed the student to put us into a secondary spin, which is a rather vicious maneuver. It'll teach him a lesson, I thought. The spin was a little worse than I had anticipated, so I tried to talk the kid through the recovery. He followed my instructions perfectly but the spin only tightened.

Still supremely confident, I took over, tried the standard recovery. No dice. As a last resort, I gunned the motor, hoping the torque would slow the (*Continued on page* 72)



The PERFECT PAIR

for landings anywhere

Here you see the tops in rolling equipment for all light planes—Goodyear Rib All-Weather Tread tires and Goodyear Single Disc Brakes. Both are products of Goodyear's 36 years of leadership in development and design — an unrivaled experience. Goodyear Rib All-Weathers are noted for their sure-footed non-skid traction and exceptionally long wear in light-plane operations involving frequent landings. The Goodyear Single Disc Brake combines unusual lightness with extremely high power and velvet-smooth action. And it is *self-adjusting* — the easiest brake to service. Also for information and data about Pliocel fuel cells, and Airfoam seat cushioning that banishes pilot fatigue, write: Goodyear, Aviation Products Division, Akron 16, Ohio or Los Angeles 54, California.

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AIRCRAFT OWNERS AND PILOTS ASSOCIATION

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is: "To make flying more useful, less expensive, safer and more fun."

Headquarters are: 1319 F Street N.W., Washington 4, D. C. Members also receive a special "AOPA" edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

LIGHTPLANE PILOT'S DILEMMA

Service is AOPA's business. Long before the association came into being, far-sighted aviation enthusiasts saw the necessity of creating an all-for-one-and-one-for-all attitude on the part of aircraft owners and pilots. Despite its position as the largest organization of its kind in the world, AOPA must further accelerate its effort "to make flying more useful, less expensive, safer and more fun." Almost every day AOPA correspondence reveals situations like the one outlined in a letter from Herbert C. Brown, AOPA 14372, of Connecticut, which states:

"I am sorry to inform you that I will be unable to continue my membership, as I am forced to give up flying. . . . It is a hard thing for me to do since I have been interested in aviation for over 10 years. . . . But I have learned a lesson and I will profit by the experience. When I feel able to pick up flying again, I will want to rejoin AOPA. For the present, I'm convinced that flying is too expensive for the pilot who doesn't own his plane."

WHAT'S THE SOLUTION?

Of course, it would seem that Mr. Brown offers the solution to his own problem: he should buy a plane. But it's not as simple as that. Many flyers are more than a bit reluctant to purchase aircraft that are really pre-war models. James H. Garnett, AOPA 18388, of Florida, puts it this way:

"There is no apparent reason why manufacturers cannot bring out a modern, inexpensive plane—one with a slow landing speed, fair cruising speed and range; one that offers such improvements as hand-operated "to-wind-up" wheels, self-starter, navigation lights, etc. All such improvements and more are available, but we're getting them in the manner prescribed by the automotive industry—a bit at a time. Take a look at our trainers, for instance. They are almost without exception noisy inadequate craft—but take another look at the price! We're getting Model "T" planes at Packard prices.

"I like flying, and I think for the sake of our country we should have as many people learning to fly as quickly as possible. But who wants to buy aircraft that are short on both utility and safety? On the other hand, who wants to pay $6,000 for the same sort of aircraft improvements that can be purchased in the automotive field for $2,000?"

Such reaction is not limited to the disgruntled few. Early this year AOPA Manager J. B. Hartranft, Jr., warned manufacturers of its widespread development in an article entitled "Any Hope for the Private Plane?" (April issue of FLYING). "If the lightplane becomes buyable and flyable for the mass market in the foreseeable future," Hartranft wrote, "much greater strides in research and development will have to be made."

Citing supporting reports and surveys indicating industry's complete indifference to such a program of research and development, Hartranft concluded that "it will be a miracle if we develop personal aircraft quickly and efficiently enough to meet public enthusiasm before it is dampened to disinterest by models now coming off the line."

With this bird-in-the-hand attitude of manufacturers forcing the more astute aircraft purchaser into a game of waiting, AOPA has placed increased emphasis on services slanted to the individual flyer—reduction of insurance cost and airport "bite," promotion of safety and utility in the use of lightplanes, dissemination of pertinent aviation information.

ALL FOR ONE

Months ago AOPA completed arrangements to obtain for its members various forms of aviation insurance at greatly reduced rates. The result is that now members are able to make substantial savings on the purchase of insurance through a program arranged exclusively for AOPA. Interest evoked by this move indicates that its benefits will accrue indirectly to a great many flying enthusiasts who are not yet members of AOPA. John W. Bryan, AOPA 24300, assistant secretary-treasurer of Parks Air College at East St. Louis, Ill., writes:

"I note . . . that you are making available to your members insurance at rates considerably lower than standard rates presently in effect . . . Parks Air College and its affiliate companies have always been very much interested in the problem of reducing insurance costs for private flyers. From the information we have received so far, it would appear that you have done an outstanding job in furthering this purpose. We would like to know more about it."

Dissemination of such information—passing on the experience and "know-how" required to get things done in the field of aviation—is only a part of the bulletin, newsletter and personal contact services which AOPA directs toward its individual members. Those services deal constructively with almost every problem confronting the private pilot, whether it requires sponsoring an industry-wide project or the introduction of some safety measure at an isolated airport or emergency landing strip.

Recently the association proposed to manufacturers and leading repair bases that "flat rate" charges be set up for engines and aircraft in the same manner as in the automotive field. It was also urged that a flat rate of engine exchange be agreed upon to save both cost and time in major overhaul. Already some manufacturers and operators are announcing plans to inaugurate such a service.

Bill Hayes, AOPA 15188, Washington, was justified in his dislike for landing fees. He asked for help, and here's how he sums up the matter: "It was bad enough to pay a dollar for every landing at the Bow Lake Airport, south of Seattle, but when Boeing threatened a similar landing fee at their overcrowded, cross-wind airport, the situation was really bad. Small local airports could not have hoped to absorb all of the traffic. It would have been a sad affair if AOPA had not come to the rescue."

The Association gave time and study lately to a reflector system of night markings proposed for airports which cannot afford expensive systems of runway lighting. AOPA approval of the system (which makes use of some 30 reflectors illuminated either by a plane's landing lights or by headlights of an automobile) makes the out-of-the-way airport safer for emergency night use—and at a nominal cost.

All this is only an indication of the far-flung services which the organized plane owners and pilots make possible for the individual AOPA member. It represents only half the service potentials of the association, however. Each pilot and owner is a potential source of assistance to the group as a whole.

ONE FOR ALL

One of the simplest ways in which an AOPA member can render valuable service to his association is to add to its numerical strength through recruitment. Burrell A. Huffman, AOPA 19771, Indiana, and Newell P. Witte, AOPA 17962, Ohio, are representative of an ever growing number of association members who are doing this very thing. Huffman writes: "I appreciate AOPA membership . . . and I want to do something about it. Will you kindly forward several application blanks at once; I'm quite certain that a number of my friends will welcome the opportunity of becoming members." And Witte's succinct comment is that he is getting "members to join as fast as they become eligible. They say there is safety in numbers, and goodness knows personal aviation is far from being safe."

There are many other ways in which the individual can serve the group. Reports on aviation malpractices have been the basis for many cleanup campaigns. Suggestions from members have been a vital source of inspiration for service-project initiation. END

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MORE than ever SILVAIRE is the STANDOUT ON THE NATION'S FLIGHT LINE. Gleaming ALL-METAL beauty that catches the eye . . . trim, sturdy construction that attracts attention immediately . . . that's SILVAIRE. Performance, easy operation, low-cost efficiency and maneuverability make SILVAIRE the ideal plane for business, for sport, for pleasure, for family flying. Cruises at more than 105 miles per hour, yet lands slowly and takes off easily on the smallest fields. High wing construction gives full visibility. The SAFETY-ZONE cabin gives maximum protection. Operation costs are approximately the same per ground mile as a medium-priced automobile. A large number of the new all-metal wing SILVAIRES have already been delivered. . . . See your SILVAIRE dealer today and ask for a free flight demonstration.

COMFORT . . UTILITY . . PLUS AIRLINE-TYPE APPOINTMENTS

Wide, deeply upholstered seats are properly placed for comfort and plenty of leg room. Large baggage compartment can be reached from inside. All instruments and controls in the gleaming simplified instrument panel of the SILVAIRE are handy and ready for instant use. Interior is finished in harmonizing grey and blue.

EASY TO FLY WITH FINGER-TIP CONTROL

Ball-bearing mounted control stick and sturdy rudder foot pedals are within easy reach to make comfort the keynote of flying SILVAIRE. Its ALL-METAL, air-balanced control surfaces give SILVAIRE highest possible maneuverability . . . and make it easy to learn and easy to fly. Finger-tip control plus the positive action elevator trim-tab makes cross-country flying easy and restful . . . pilot fatigue is reduced to the irreducible minimum.

STRONG, WIDE LANDING GEAR

The strong, specially designed tubular steel SILVAIRE landing gear has stainless steel tie-rods that will withstand 14,000 lbs. of pull. Semi-cantilever knee action landing gear with hydraulic shock absorbers makes landings gentle and easy. Landing gear fairing (or cover) gives increased air speed and clean, attractive lines.

FIRST IN *All-Metal* PERSONAL PLANES

THE NEW All-Metal Silvaire WING

The new ALL-METAL wing makes SILVAIRE the world's first all-metal light plane in volume production that uses absolutely no fabric. Extra strength, extra beauty, extra performance, extra speed, extra low maintenance cost . . . that's the NEW SILVAIRE with the ALL-METAL WING. The new exclusive stressed skin design gives five to eight miles per hour greater speed—and the gleaming eye appeal is unmatched in the personal plane field. Designed around two metal spars, only two ribs are used in each wing. A single, strong, non-welded strut between the wing and the fuselage replaces the previous V-strut and jury-strut design and gives easier access to the cabin and added visibility for both pilot and passenger. Each wing is composed of 9 easy-to-replace panels. No wing covering . . . no doping . . . no extra maintenance costs are necessary. Combined with the exclusive SAFETY-ZONE cabin, the new ALL-METAL wing reduces fire hazards and insures maximum protection for both pilot and passenger.

EXCLUSIVE SAFETY-ZONE CABIN

Just as the turret top gave added safety to the present-day automobile . . . so the exclusive SAFETY-ZONE cabin of SILVAIRE gives added safety to personal flying. The strongest structural members in the entire aircraft frame the cabin area. Sturdy cross-beams pass under the seats and flooring. Two strong beams of metal above the cabin support the wings and give extreme strength. Safety bracing from upper crossmember gives extra strength between the engine and the cabin area. And remember, the SAFETY-ZONE cabin is an exclusive SILVAIRE feature!

28 LUSCOMBE EMPLOYEES WEIGHING MORE THAN 3500 LBS. ON THE NEW LUSCOMBE ALL-METAL WING

Designed around two strong metal spars, only two ribs are used in each wing. A single strong, non-welded strut between the wing and the fuselage replaces the previous V-strut and jury-strut design. Gives easier access to cabin, reduces drag and adds visibility for both pilot and passenger. Each ALL-METAL wing is composed of 9 easy-to-replace panels.

SILVAIRE by Luscombe, including the new ALL-METAL wing, is manufactured under U. S. Government-approved type certificate and is Government certified to be completely airworthy.

Silvaire
BY LUSCOMBE

LUSCOMBE AIRPLANE CORPORATION
DEPT. F
Dallas, Texas

Wing with a Future

(*Continued from page 40*)

move forward toward the suction are in the boundary layer—that is, the layer of air closest to the wing. If the boundary layer did not exist, all the air particles would have enough momentum to continue rearward against the great suction acting forward on the wing. But the friction with the wing slows up the particles in the boundary layer so that they can move forward toward the nose suction.

This forward flow clashes with the rearward flow, causing the main air flow to leave the wing surface with resulting turbulence. The boundary layer is actually torn loose at Point G in Figure 1 with resulting loss of lift. With the boundary layer controlled, lift can be tripled.

The place to get rid of the boundary layer, naturally, is in the region where it causes trouble. There are two ways to get rid of it. It may be sucked into the wing, or it may be accelerated by discharging a jet of air along the surface to speed up the retarded particles. Or both methods may be combined.

Either method results in a high speed flow of air close to the wing, for when the boundary layer is withdrawn into the wing, the high-speed air above the layer replaces it. In general, suction is somewhat more effective than discharging a jet of air along the wing surface but there are other differences so that one type of slot suits certain objectives better than the other. The through-slot or Handley-Page slot is a type of discharge slot (see Figure 2).

With the Handley-Page slot an increase of only about 50 per cent in maximum lift is possible because the jet does not go

Figure 1

fast enough. A blower driven by a motor, however, can produce a stronger jet and correspondingly greater increases in lift. More important, the blower produces

Figure 2

maximum lift for all normal angles of attack.

Much wind-tunnel research has been done and flight tests have been made on an airplane equipped with a wing adapted to boundary layer control by suction.

The plane's wing was built for the aircraft laboratory of the Army Air Forces at Wright Field and made in the shops of the Dow Chemical Company at Bay City, Mich. The wing was fitted to a Vultee *Vigilant*, also known as the L-1.

The object of the flight tests was to determine whether the same large maximum lift coefficients could be obtained in a full-size wing as on models in the wind tunnel. The "hump" over the cockpit on

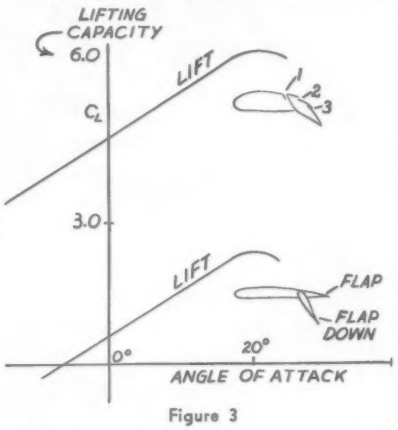


Figure 3

the plane contained experimental equipment, including a blower just above the lower surface on the wing center section which was driven by an auxiliary engine located in the fuselage. There was no reason for the unsightly "hump" being built on the plane except for convenience. It was easier to test the equipment that way and it was not desired to change the existing structure of the airplane.

The plane was delivered to Wright Field June 19, 1944, and experiments conducted upon it during the ensuing year substantiated the predictions of increased maximum lift as illustrated in Figure 3.

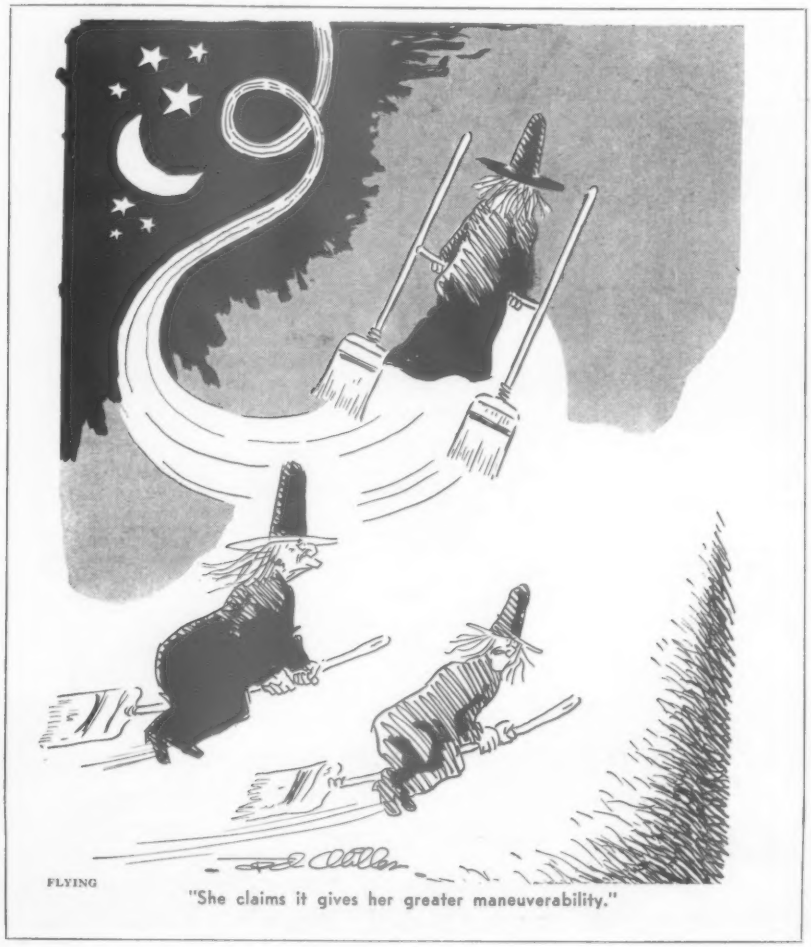
Now what does an increase of lift values by two or three times mean?

For one thing, the wing areas could be reduced from 50 to 70 per cent. This would increase speed and decrease initial cost. Or the area of the wings could be retained and the landing speed reduced. A doubling of the lifting capacity would reduce landing speed 30 per cent. Or any compromise between the extremes could be arrived at.

Equally as important would be retaining lateral control at speeds which would stall and perhaps spin conventional aircraft. Lateral control is lost because the airflow burbles over those wing portions adjacent to the ailerons. With the boundary layer removed, there would always be full lateral control. Loss of lift and loss of lateral control are collateral symptoms of the same disease. Cure one and you cure both. And in so doing you also cure spins.

Large lifting capacity does not mean that the pilot would always land his plane at its slowest speed. But the slow speed is there if needed. On gusty days, pilots would prefer to land faster. But a forced landing in a rough field would probably call for the slowest possible landing speed. Under all these conditions, powerful and positive lateral control would be a first need.

Why haven't previous attempts been



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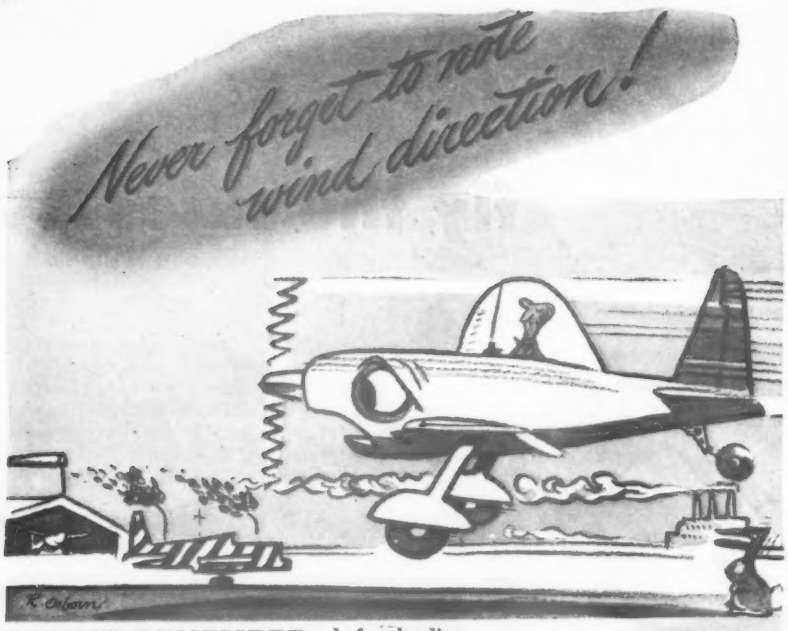

ALWAYS REMEMBER — before landing to check wind direction by observing wind sock and tee, or other wind indicators.

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made to control the boundary layer by suction? Its advantages have been known for years but only recently have air-volume and power requirements been brought within practical limits. The volume of air to be handled by the blowers should be small, since it must be conducted within the wing which usually has much of its interior used for stowing equipment or fuel. Power requirements also must be as low as possible, to reduce weight and cost. In a single-engined airplane it is planned to operate the blower by the propeller operating as a windmill. Then in case of engine failure, power would always be available from the relative wind to assure a safe slow landing.

Speed gains will be substantial. Some of this gain will come from reducing wing area. But the most significant gains in speed will be obtained by maintaining a truly laminar flow of air in the boundary layer.

Boundary layer control assists the laminar flow of air which so increases wing efficiency. In laminar flow, the infinitesimal laminae within the air layer slide upon each other without mixing so that the slow laminae next to the wing surface do not contact the outermost laminae. As long as there is no migration of air particles from one layer to another, drag is very small.

Even in the so-called laminar flow wing, the laminar character of the air layer tends to be lost if it flows over too broad a surface or goes too fast. The air layer may change from a smooth flow to a turbulent flow, increasing drag and decreasing lift.

Slots properly spaced can be used to draw the boundary layer into the wing just before it is about to become turbulent. About 80 per cent of the wing can be made to have a laminar flow—thus reducing drag remarkably. The laminar layer in such slotted wings, furthermore, is more tolerant of dirt and imperfections in the wing surface.

With proper boundary layer control, airplane drag should become a small fraction of present-day values. It should be cut in half within the near future.

A fundamental solution to the boundary layer problem, furthermore, should make contributions to many other aircraft problems. Design may be improved. For example, the air which is circulated in the wing can be heated for ice control. The means used to reduce drag can permit the designer to introduce thicker and hence stronger wings. By adopting shell-type construction, such wings can contribute to ruggedness and lower costs.

Airplanes with boundary layer control may cost slightly more than conventional planes at first because of the cost of the blower. But the advantages of boundary layer control are worth more than the cost. It may even be that on a comparable performance basis, aircraft with boundary layer control will cost less than those without it. And eventually, the performance of airplanes with boundary layer control will be so superior to other types that the enlarged demand for them should permit a mass-produced low-cost air vehicle.

The present attack on the private air-

PIPER CUB Sea Scouts

There are two Piper Cub Sea Scout models—the Super Cruiser and the Special equipped with floats. Regular wheel landing gear, also, shown on the two models illustrated below, comes with each Piper Cub Sea Scout and is conveniently interchangeable with the floats.

PIPER CUB Special

A two-passenger plane with dual controls. The 65-horsepower engine is equipped with a muffler. Standard equipment includes, also, stirrup step, one-piece Plexiglas windshield, compass, cabin heater, carburetor heater, dual hydraulic brakes and steerable tail wheel.

PIPER CUB Super Cruiser

A three-passenger, 100-horsepower plane with an electric starter and muffler. Has a 600-mile cruising range. Standard equipment includes, also, one-piece Plexiglas windshield, dual controls, parking brake, cabin heater, dual hydraulic brakes and full-swivel tail wheel.

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It's the *Piper Cub* that has outsold all other light planes combined. It's the *Piper Cub* in which most of today's pilots learned to fly. It's the *Piper Cub* that carried generals over battlefields in World War II and achieved fame for its service in combat. It's the *Piper Cub* that costs less than any other two-passenger plane you can buy today. It's the *Piper Cub* that *proved* its safety and economy by *billions* of miles of flying!

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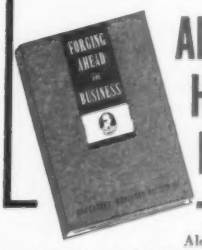

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plane problem is backward. It begins with cost as the master rather than function. There is, of course, a market for a low-cost airplane regardless of its character, and this market should be supplied at once.

But it is a mistake to believe that refinement of pre-war designs in small details is going to lead to widespread use of airplanes. The airplane today is a poor instrument for doing many of the things it should do. It requires skills beyond the range of the "average" man. It is unsafe for many persons who do fly. It lacks utility to a very large degree.

The important thing now is not how cheap but how right is the airplane. If it isn't right, it will never be cheap.

A proposed plane with boundary layer control is illustrated. The wing has a flap with an induction slot near its forward edge. Two discharge slots are located back of the induction slot. A blower draws in air through the forward slot and discharges it through the rearward slots. Thus the air is made to serve twice and no energy is thrown away in discarded air as it would be if only suction slots were used. To insure boundary layer control at all times, the blowers are to be driven by the propeller acting as a windmill in event of engine failure.

A personal airplane with boundary layer control is expected to appear sometime late in 1946 or in 1947. A transport plane with boundary layer control will appear at a somewhat later date. The transport is expected to make large reductions in operational costs per ton mile and per passenger mile.

Boundary layer control will bring to the private pilot greater performance in speed and load-carrying capacity. The airplane incorporating it can be smaller and more compact. It will provide strong and positive lateral control under all conditions. It will be spin-proof.

Pilots of such craft will be able to approach landing areas at steep gliding angles and, if necessary, at speeds slow enough to fit the conditions of atmosphere and terrain. The utility and safety of the small airplane will be increased many times. END

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THE chaplain was a regular guy and he figured that if he was going to stay on the right side of his boys, he'd best take some flights with them.

One day he piled into a Liberator *cargo plane for the ride over the "Hump" from India to China. About an hour out the plane iced up, lost an engine and all hands bailed out. The sky-padre landed near a small stream, and settled down to living out of his emergency kit and waiting for a most improbable rescue.*

Two days later he heard the putt-putting of a small plane and looked up to see a Cub *flying overhead. The plane swooped down, flew over the camp-site, dropped a parcel and went on into the distance.*

The chaplain watched the package land in the middle of the stream, then scrambled after it. Before he realized his predicament he slipped on the rocks and went head over heels into the icy water. But, finally, he reached the box, grabbed it and scrambled back to the bank. In trembling anticipation he broke the seal of the container.

Inside was a small metal tube that contained a scribbled note. It read: "Chin up, old man."

—Lynn Smith

ON either side stretched the green Brazilian jungle making the idea of a forced landing most unpleasant as we flew those single-engined Warhawks *down to Natal. The mother plane, a lumbering, stripped-down* Liberator, *was ambling along slowly and instead of leading the flight was usually trailing in the fighter's prop-wash.*

Suddenly the bomber pilot's voice rattled over the air, filled with excitement: "Just lost No. 2 engine . . ."

Casually a fighter pilot picked up his microphone and, with a tantalizing touch of sarcasm, replied:

"Whatcha worrying about, bub? Way I count ya still got three engines left, ain't you?"

—Hamilton Fredericks

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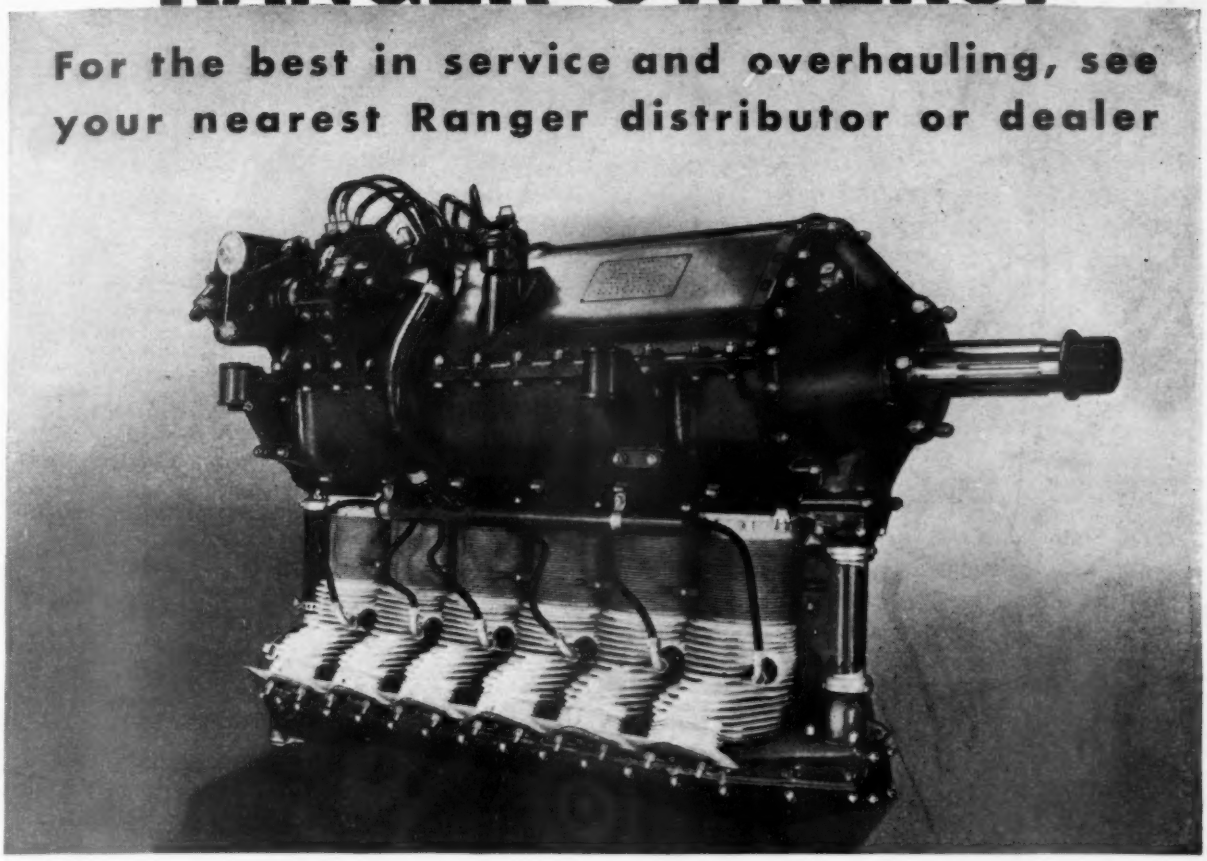

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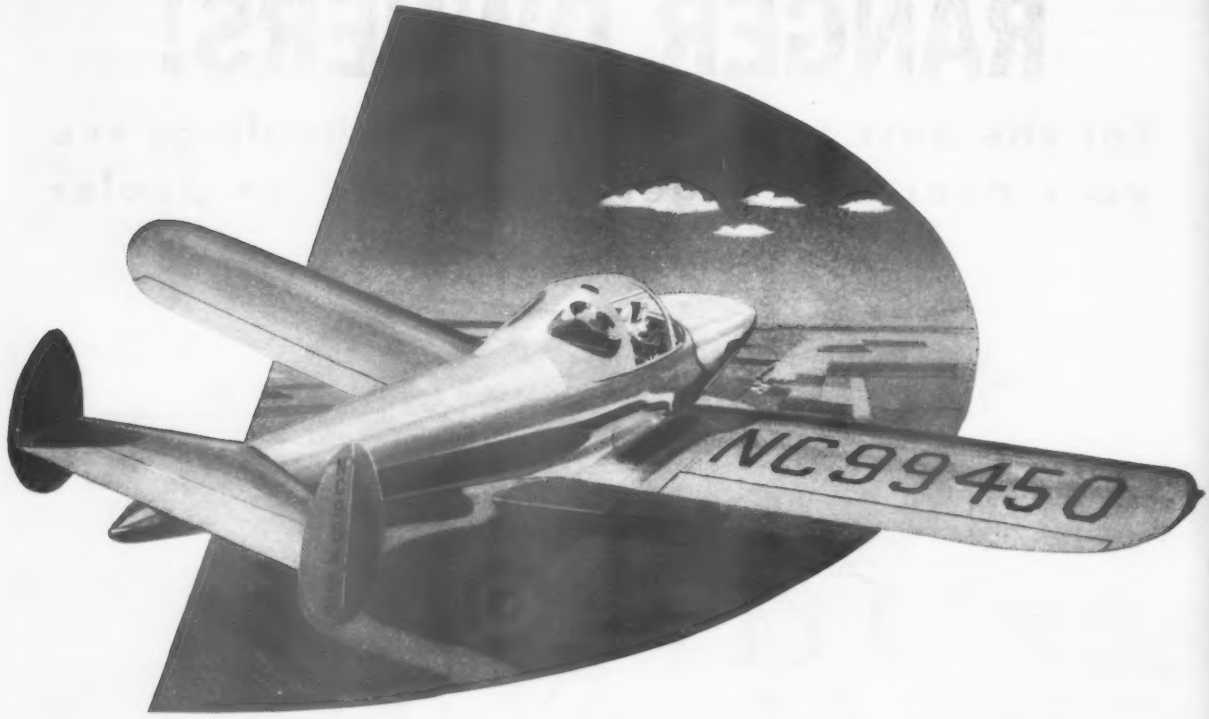

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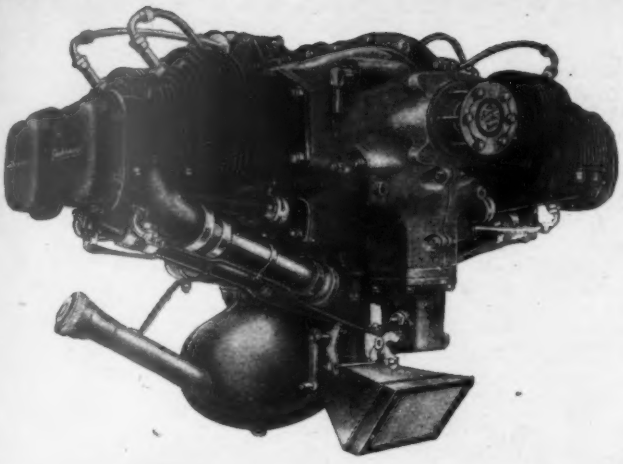

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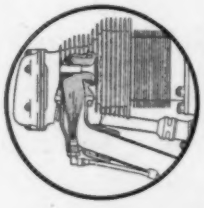

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Blind Landings for the Amateur?

(*Continued from page 32*)

strand temporary radio antenna installed at Riverdale, Md., was found to have insufficient range during the flight from Riverdale to Indianapolis, a new permanent antenna was installed at the Hoosier Parks Airpark after our arrival at Indianapolis. I was accompanied on that flight and on the GCA flights by Julian Zenitz of the *Ercoupe* company. He also acted as check pilot during the GCA approaches.

Preliminary plans were made with J. H. Hilton and A. B. Johnson, the two CAA controllers who were to talk me down in the actual flights. Because they had had very little previous experience with so small and scantily-equipped an airplane, it was necessary to work out in advance a series of emergency problems with which the private pilot might suddenly find himself faced. It was agreed, too, that the private pilot having a minimum radio receiver would be wisest if he tuned to the nearest large radio-range station, then flew directly to that station. Once over the station—and assuming the nearby large airport would have a GCA unit installed—the GCA personnel could take over.

Assuming—as I was—that this particular private pilot had no transmitter, he could tune his receiver to the GCA transmitting frequency, then proceed to fly a standard emergency pattern that would be seen quickly on the GCA unit's radar scopes. I decided to fly a continual square of about one minute to a side. Hilton and Johnson would have to locate my *Ercoupe* amongst all the air traffic around Indianapolis, give me radio instructions that would cause me to change my course in a way that would assure them they were tracking the right airplane, then talk me right down to the runway. We agreed on five basic problems:

1. The GCA unit would have to locate me, then talk me in while I used the directional gyro, sensitive altimeter, attitude gyro and air speed indicator.

2. Same as above, except that the plane's standard magnetic compass was to be used instead of the directional gyro, which was to be left caged.

3. Same as No. 1, except that no special instruments could be used. It was assumed, however, that I could see the ground, but only enough to keep the plane level.

4. Same as No. 1, except that I could not use the directional gyro and was not able to control accurately my rate of descent. The GCA controller was to use a step-down procedure, telling me to descend to lower levels as I got closer to the field.

5. Same as No. 1, except that the GCA controller could use only his 30, 15- and 7½-mile-range PPI (plan position indicator) scopes, and not his precision short-range scope which he normally would use for the great accuracy necessary for the actual talk-down landing of an airplane. This is what a GCA controller would use in case all his precision equipment failed during an actual approach. The results would be a good deal less accurate than usual, but the airplane could be talked in until the pilot could see the airport clearly enough (ceiling 300 feet, visibility one mile) to make his own landing. In this problem, meanwhile, I was to use all the instruments available to me.

Each of the five problems was flown with the *Ercoupe's* windshield and left-hand side window almost completely covered with heavy wrapping paper. Zenitz, when riding as check pilot, could see out of a small corner of his windshield, the right side window and, by sitting on a high cushion, over the top of the left side window.

The northeast runway—5,120 feet long and 100 feet wide—was used for all the problems. Most of the time the approaches (and two actual landings) were made cross-wind, another point in favor of the *Ercoupe's* tricycle gear. Hilton and Johnson pointed out that the Army prefers runways 300 feet wide for its GCA operations, to assure maximum accuracy for actual landings.

Taking off for the first problem was an interesting experience. I tried it completely blind, using only what instruments there were in the cockpit to help guide me. While Zenitz watched out of his peephole, I opened the throttle wide and held the tricycle gear on the runway, steering it like an auto. When the airspeed passed 60 I pulled back and climbed away at about 65 m.p.h. The control tower kept a close watch on us, as they did throughout the tests, because of our blanked-out visibility. Tower operators relayed traffic instructions to us through the GCA controller.

For the first problem we flew away from the field at low altitude, so as to stay below the sweep of the radar search antenna. Flying out to the southwest I then climbed steeply to 2,500 feet, a good altitude for the radar crew to pick us up. There was a great deal of local air traffic in the area: dozens of aircraft landing and taking off at Weir Cook Field, and heavy traffic at three other private airports well within GCA range. At approximately 10 miles from the GCA unit I started to fly the square pattern. I completed three sides of the first square without hearing anything in my headphones. Then, just as I made the fourth turn, Hilton's voice came on the air:

"Cherokee [the GCA station code name] to *Ercoupe* 238 [the plane's license number was NC-99238]. Cherokee to *Ercoupe* 238. If you read me level off and steer a course of 235°."

I did. Because I could use the directional gyro it was no problem to get to and hold that course. The air was quite rough and, in so light an airplane, it was all I could do to hold it steady long enough for the magnetic compass to calm down. Once set, the directional gyro moved only when the airplane itself moved; throughout the entire group of problems the magnetic compass oscillated so wildly it was useless insofar as GCA operations were concerned.

Hilton's voice again: "Cherokee to *Ercoupe* 238. Now turn left to a heading of 180°. I think I have you in sight. I want to make sure."

While Zenitz watched for other planes I turned to 180°, concentrating on the directional gyro, altimeter and airspeed.

Hilton again: "I have you in sight now. Turn left to a heading of 030°. You should be flying at an altitude of 2,500 feet above the ground."

It was easy to hold that heading and altitude, even though I couldn't see anything but the sky straight above, the instruments, Zenitz beside me, and an occasional glimpse of sky out the window on Zenitz's side. Then, after about two minutes, Hilton's voice called:

"Cherokee to *Ercoupe* 238. Turn right to a heading of 045°. That's it. Now hold it. You are almost lined up with the runway and are seven miles from the field. Now turn left to a heading of 035°."

Nothing hard about this. You just have

15 YEARS AGO

FROM the October, 1931, issue of this magazine.

A new world's altitude record for lightplanes was set in a Heath *Parasol*, powered with a Poyer engine, by Merrill Lambert. He was up about three hours and reached an altitude of over 19,000 feet. Former record of 17,047 feet was held by a French army officer. The Lambert flight was made without oxygen flasks.

A two-place monoplane called the *Falcon*, was advertised for $995. And for an additional $150 the makers promised to include a steel hangar. A demountable wing that required "only five minutes to unlock and swing back" made storage requirements a simple matter.

Organization of the United States Amateur Air Pilots Association was announced to promote and codify private flying.

Designed to carry 40 passengers in luxurious comfort, the Sikorsky S-40 amphibian was successfully tested at Long Island Sound. Powered with four Pratt & Whitney 575-h.p. engines, the plane attained a crusing speed of 110 m.p.h. Wing span was 114 feet; weight, fully loaded, was 35,000 pounds.

Vincent J. Burnelli, airplane designer, announced completion of wind tunnel tests on a new commercial air transport which was to carry 10 passengers and 1,000 pounds of mail at a cruising speed of 170 m.p.h. Top speed was to be "well over 200."

Double fuselages were featured in the new French transport, the Bleriot B-125. The plane's two Hispanzo-Suiza, 500-h.p. water-cooled engines were arranged tandem fashion fore and aft of the pilot's compartment which was located on the center wing section between the twin fuselages. Passenger cabins were located in each fuselage nose. Cabins carried six seats.

Both Germany and France were reported to be building stratospheric planes capable of flying 400 to 600 m.p.h. at a 50,000-foot altitude. Though details were vague, the French stratospheric plane was said to be a small, all-metal model with a torpedo-like fuselage, streamlined throughout and equipped with a supercharged motor.

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to be able to hold your altitude, keep your plane on an even keel, and read the numbers on your compass. And just in case those numbers confuse you, he even tells you what direction to turn.

Hilton started a constant stream of directions now: "Cherokee to *Ercoupe* 238. Start descending at a rate of 400 feet per minute. Turn right to a heading of 040°. Now left to 037°."

The rate of descent had had me worried. But we'd doped that out at the *Ercoupe* plant before we left. Just set the throttle at 1,500 r.p.m. and hold the airspeed at 70 m.p.h. We tried it several times and it gave us exactly 400 f.p.m. each time. Hilton now was changing the heading every few seconds, which meant he was having me "bracket" the runway so that I'd end up headed straight down the middle.

"Your glide path is good," Hilton's calm voice was keeping us posted now, "Now you're a little above the glide path." A little forward pressure on the wheel fixed that.

"You're now a mile and a half from the end of the runway. Glide path is good. You now are passing over the approach lights. You're a little low on the glide path. Pull up a little. That's it. Glide path is good. You are 50 feet above the runway and a little to the left. Take over and land visually."

This was it. You couldn't help being tense at this point. He'd told you how close to the ground you were. You couldn't see a thing but that wrapping paper and the instruments. Zenitz was craning his neck, popeyed. He was nervous too, but apparently everything ahead looked okay to him because he just sat there and fidgeted. Then, when Hilton told me to take over and land it myself, I slapped my side window down, stuck my head out the side and there was that long runway. It was a simple matter to touch the wheels, then give her the gun and take her off for the second problem.

There it was. My first blind approach and landing. No elaborate, expensive equipment necessary, just a few fairly reasonable instruments and a cheap radio —and in a small private airplane. No complex, intricate techniques. Just do what the man tells you. That's the hardest thing of all, trusting that man on the ground. That's why a lot of the old-time pilots want no part of such a system. "Nobody's gonna tell *me*, etc. . . ."

Problem Two eliminated the directional gyro. Otherwise everything the same. But the magnetic compass was useless. The rough air bounced it round and round. Hilton gave me headings to fly but it did no good. He finally realized I couldn't fly the magnetic compass accurately so he stopped giving me actual headings. Just "turn left until I tell you to stop. Now a little to the right. Start letting down. A little left. More. Now straighten out." Then I was a few feet over the runway again. This time I just stayed under the hood, letting the ship settle slowly. Zenitz took over just as the wheels touched and we rolled to a stop.

For Problem Three, I was permitted to see out. The windshield was covered, however, so I flew looking out the left side. I went back to the range station and started the pattern again. Within seconds they had me. This time it was Johnson's voice. Being able to see, and just watching altimeter and airspeed, this problem proved the easiest. I just looked at the scenery below while Johnson directed me left, then right, then around, then down the glide path. Sitting there watching the runway miles ahead, while he lined me up just as though he'd been flying, was a peculiar feeling. Once again we were down to 50 feet, the runway lights were flicking by each wing, then I pulled up for Problem Four.

It was almost as easy as the last. I was back "on instruments" again, but did not have to set that rate of descent for the approach. Hilton simply told me what altitude to descend to each time I approached a mile or two nearer the field.

For Problem Five I flew back out to the range station, climbing. A few minutes away from the field Hilton suddenly called: "There's an airplane overtaking you from the right and about a mile and a half behind you. Keep an eye on him."

I was back flying those instruments again so Zenitz did all the neck-craning. Sure enough, climbing up right toward us was a twin-engined Cessna. In a few seconds Hilton called to say that the airplane should be right off our right wing. It was, within a few feet. A few minutes later he steered me away from one of those private airports where there was a lot of local traffic.

This last problem made it tougher for the boys on the ground. They had to get me down with only their long-range scopes. Best they were shooting for was to get me down on the field safely, but not precisely lined up down the middle of the runway. Within a few minutes Hilton had talked me down into landing position safely within the field limits and just a few feet to the left of the concrete runway. Had it been a 300-foot runway I

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FIRST IN FLIGHT

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would have landed on concrete anyway. As it was, I was lined up to land on the grass—which is where most of the light-plane traffic on the field had been landing and taking off all day.

It takes very little imagination to visualize the value of GCA to private flying. I could well have been caught on top of a solid overcast during a cross-country flight; better pilots than I have had it happen. Or my destination might suddenly be fogged in, catching me without enough fuel to fly to an alternate. Or I might have been caught out after dark. Experienced pilots could recite dozens of other such emergencies. Yet every one of these instances could easily be handled by GCA with no trouble whatever. Any private pilot could go through the entire procedure, as I did, with no advance training. And the system works the same for a *Cub* or *Constellation*.

As soon as the Army and Navy have set up a substantial number of "havens of safety," the private pilot can feel quite comfortable about using them if his small airplane has the following non-standard equipment: sensitive altimeter, artificial horizon, directional gyro, and radio (preferably a permanently-installed transmitter-receiver).

There was a touch of irony to my whole Indianapolis experience. The only airline seat I could get back to Chicago was on an Eastern Air Lines plane leaving the airport at seven in the morning. Which meant getting up at 5:30. At the airport we found a heavy fog. The airliner arrived from Louisville, circled once, then went on to Chicago without landing. That afternoon I was on a train after having been stranded by an instrument-loaded airliner that passed over Indianapolis because of reduced visibility. And just the day before I had made five complete flights down onto the same airport with nothing but a few simple instruments and a cheap radio! END

I Learned About . . .

(*Continued from page 54*)

spin, because we were turning to the right. Nothing happened. I glanced at the altimeter. . . . 4,000 feet! That was too darned low! I picked up the mike, ordered the boy to bail out.

The student tore off his cap and headset, opened the canopy and started to rise. He turned red, the veins stood out on his neck with the effort, but he couldn't get out of his seat. In his excitement, he had forgotten to unbuckle his safety belt! Frantically I pounded on the canopy, but to no avail. With a groan, I settled back in my seat, fastened my safety belt. I couldn't let the kid go down alone! Ducking my head under the edge of the cockpit so I couldn't see the ground, I tried my last trick. With both hands I pushed the stick to the panel, put in full opposite rudder, and prayed. Slowly the needle of the turn and bank indicator came back to center, so I snapped the rudder to neutral, cautiously raised my head. The first thing I noticed was the sage brush whizzing by like telephone poles past a speeding train window. Our plane was on its back, at about 100 feet! I gasped, held forward pressure on the stick to keep the nose up, then gingerly easing the stick over to the side, half-rolled back to an upright position. The sweat was dripping off my brow, and my damp shirt sticking to my body. That one had been close!

As I climbed back to traffic altitude and headed for the field, the kid turned around to give me a sickly grin, his face as white as a sheet. I wondered if I looked that scared. I certainly felt it.

Safe on the ground, I sat in the cockpit momentarily, hoping my knees would quit shaking. The kid crawled out, mumbled. "It was my fault, sir. I forgot to open my safety belt." I nodded. "Mistakes will happen. We'll get another plane and try it again." He shook his head. "Not me, sir. I'm through flying . . . forever." He meant it.

A quick check-up of the controls revealed the rudder cables were far too loose, making the rudders only about three-quarters effective. Now whenever I think of this incident, I can't help but remember what my old Regular Army instructor told me just before I was graduated: "Remember, Mister, 90 per cent of airplane accidents start before you leave the ground." I finally learned about flying from that. END

FLYING "But Spike, ya just gotta learn to ride the range without yer horse!"

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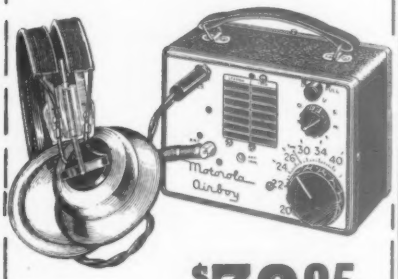

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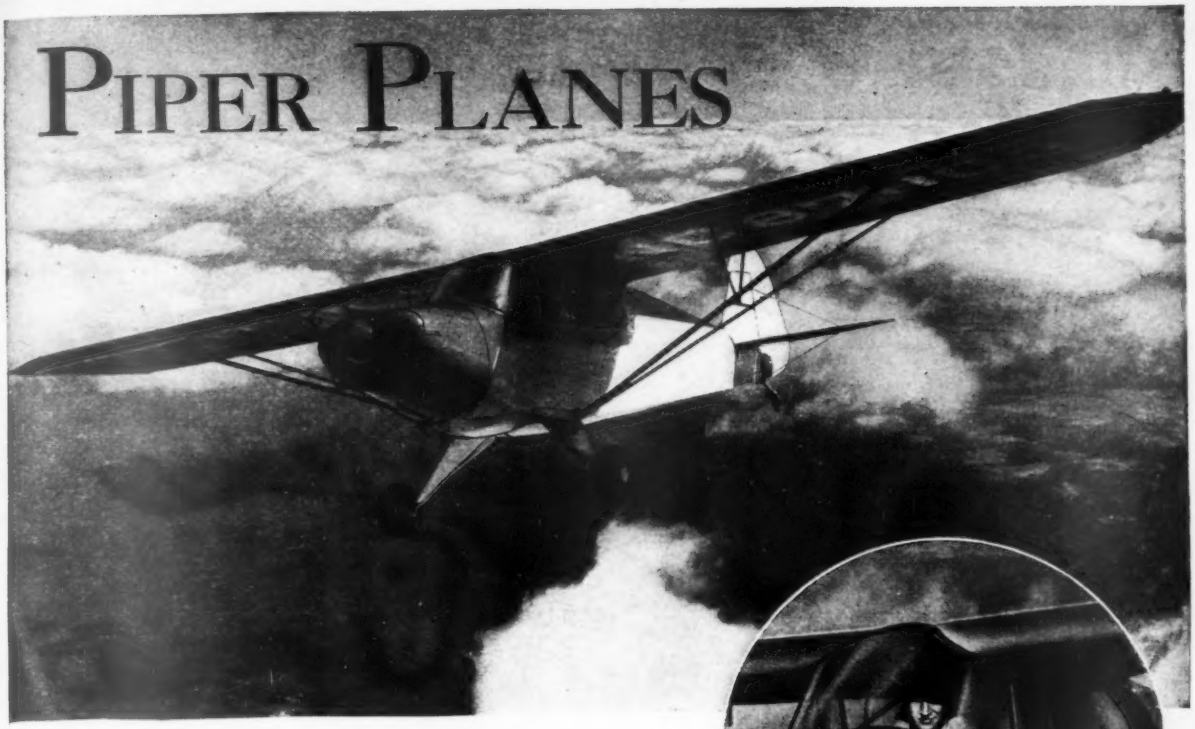

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London Letter

(*Continued from page 42*)

may be different. The engines used for the new attempt may have axial flow compressors instead of the centrifugal flow compressors used in the Rolls-Royce *Derwent* turbojets. Axial flow units would enable the engine nacelles to be slimmer and so to cause less drag. Regardless of changes, there are many here who think it unlikely that the *Meteor* can be persuaded to go any nearer to the speed of sound at sea level than somewhere in the vicinity of 630 or 640 m.p.h.

Fedden Flat Engine

Sir Roy Fedden, who was responsible for the design of the Bristol sleeve-valve radial engines, left the Bristol Company some time ago to form his own company. Now its program has come out. It includes a 135-h.p. flat six, air-cooled, sleeve-valve engine for use in personal aircraft. It measures 31.14 inches wide by 35.6 inches long by 13 inches high, has a compression ratio of eight to one and uses gasoline injection.

Another new Fedden engine is a prop-jet unit rated at 1,350 h.p.

Who Did It First?

The old question of who did it first came up again when the Weir-9 helicopter gave its first public demonstration at the Southampton air pageant on June 22. This aircraft, built and designed by the Autogiro Company, has jet torque control. A jet, squirting sideways at the tail, does what the torque rotor does in a Sikorsky.

The Weir-9 was claimed to be the first helicopter in the world with this form of control. Then it was said that the German Doblhoff had priority. This aircraft is jet driven; that is to say the lifting rotor is jet driven. Too little is yet known here of the Doblhoff to decide the issue but it has certainly flown successfully.

Air Horse

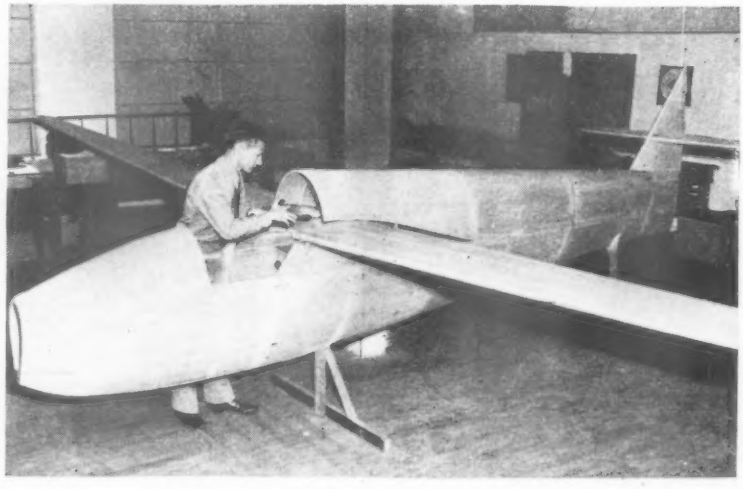
The Autogiro Company is now building a strange form of helicopter which they call the "Air Horse." It has three lifting rotors and is designed to lift between three and four tons. Its primary duty would be pest control in agricultural areas.

A demonstration of pest control by helicopter was given at Cambridge with a Sikorsky. One of the new insecticides was sprayed from the aircraft.

Appointments

Sir Frederick Handley Page has been elected president of the Royal Aeronautical Society. W. R. Verdon Smith (of the Bristol Company) has been elected president of the Society of British Aircraft Constructors for 1946-47. Vice-president is Robert Blackburn.

Sir Archibald Rowlands has been appointed permanent secretary to the Ministry of Supply—through which all orders for aircraft in Britain must go. END



PINT-SIZED SAILPLANE

ONE of the smallest sailplanes ever built is under construction by Ray Parker of San Diego, Calif., who hopes to break the 465-mile long-distance record for this type of craft. The craft will weigh 704 pounds, is 19 ft. 3 in. long and has a 34-foot wing span. With an 88 square foot wing area, plus 30.5 feet in ailerons and flaps, wing loading will be high.

Parker designed his plane for cruising at least 55 m.p.h., however, and intends to make his record try in the Mojave desert, where he has observed that air currents start to rise as early as 8 a. m. and continue for 12 hours. The prevailing wind is 35 m.p.h. due east. Parker's craft will have standard instruments and an oxygen system.

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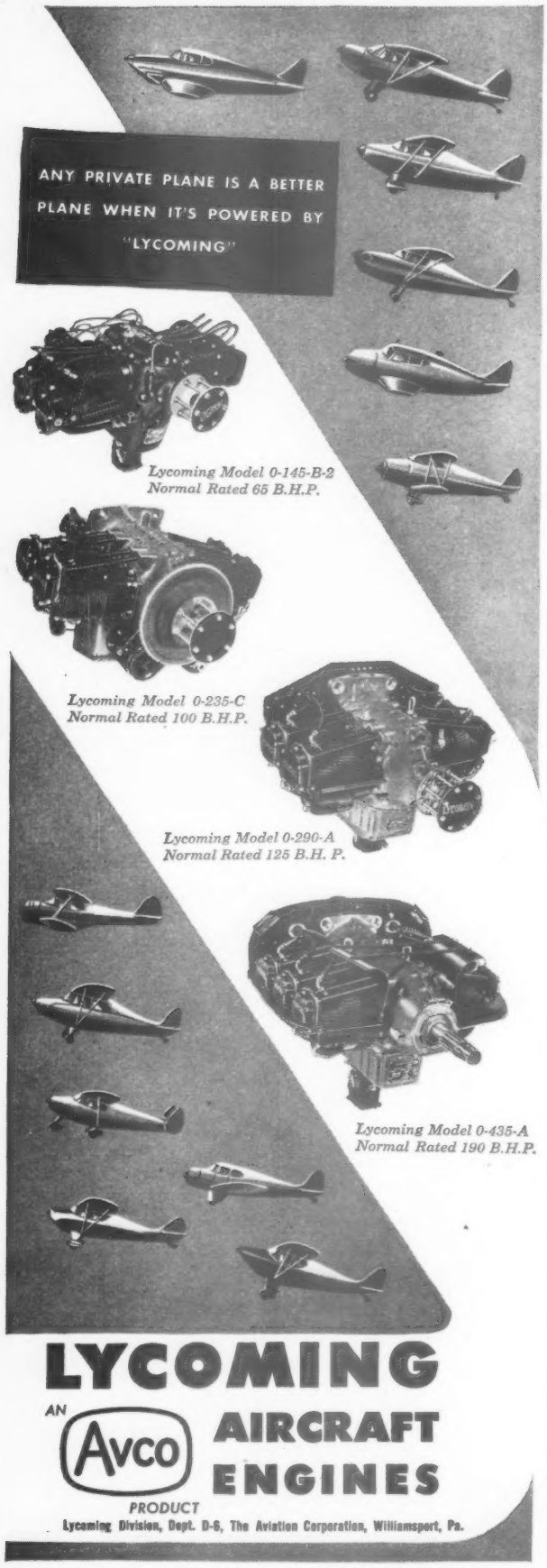
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So You Don't Like My Airport!

(*Continued from page* 35)

Since then, I have placed a 16-cylinder limousine in service as an accommodation for the many transients who hit Alamo. The $1 charge does not pay the cost of operation or insurance and is below taxi rates. Yet many pilots think the service should be free.

I'd certainly be happy if one person would say: "Thanks for the comfort, time-saving and economy."

Today's pilot has to realize that he isn't king of the skies any more. He isn't a rare, unusual and super sort of man. So many people are flying that the daredevil aviator hasn't stars in his eyes and, furthermore, sometimes he lacks the instincts of a gentleman.

Here, where we knock ourselves out trying to give service, the other day a pair of pilots climbed into their airplane and calmly watched us twist their propeller—a mechanic and I. We cranked for half an hour. The little four-cylindered engine wouldn't come to life. We were neglecting other duties to wear ourselves out.

Finally we investigated. The pilot hadn't turned on his gas.

Sorry? Not a bit. It was a very funny joke—to him. Laughing, he flipped the valve on. The engine fired immediately and he taxied away without a word of gratitude, without an apology. He was still laughing. I wasn't. An hour had gone by the board due to thoughtlessness and carelessness—figuring the time of my mechanic and me.

There is another angle to this beating the operator has been taking which I don't like. I came out here to a mesquite and sagebrush-covered 640-acre hunk of desert, kicked the sidewinders and scorpions off it, graded it, built hangars and offices, installed an electric system and put in water, met incoming pilots with a waving of arms so that they'd park properly, had a ready gas tank, offered everything from hotel reservations and food to weather reports and long distance telephone service.

I just about broke my back, but I didn't mind—I love flying and I believe in it. Added to my own sweat is an additional $50,000, raised between landings and take-offs.

Considering this it doesn't seem right that an operator should face continual complaints about landing fees, although we charge none at Alamo. I hope that it never will be necessary. The automobile drver who may have from $500 to $2,000 invested in an automobile thinks nothing of paying from 10 cents to a dollar to park. Yet if he should become the owner of a $15,000 airplane he would raise holy ned because somebody wanted to collect a small fee for parking and guarding his magnificent contraption. What about the investment in the runways on which he landed? Have you ever tried to push a ton-and-a-half airplane around in a high wind?

The answer, you say, is: "He buys gas, doesn't he?"

Sure. The motorist buys gas at the parking lot, too. The operator of a lightplane buys an average of five gallons, if he buys at all. I guarantee that an operator with $50,000 tied up in his field is not going to retire to clover as the result of gasoline sales in five-gallon installments.

The actions of some pilots are hard to understand. For instance, there is one pilot who flies into my field constantly. I don't even know his name. He lands "way out yonder" and parks some 500 yards from my operations office. He doesn't drop in to say hello and how have I been? He gets into a car and drives away.

I can take that. But the other day, during a wind, his airplane whipped around and missed by inches a fine, new aircraft belonging to a regular patron. It was a miracle that both planes weren't damaged. I would have felt liable for damages to the man who was legitimately parked. I investigated and found out that in spite of the wind my uninvited guest had not even set his parking brakes.

Dusting? Pilots never realize that they have little things up in front which go around and stir up air. This air, in turn, picks up dust which goes into the darndest crannies and nooks, people's eyes and clothing, under engine covers, through windows and doors. The very charming woman who operates our restaurant at Alamo claims she has housemaid's elbow from lowering windows to keep the customers' steaks from having a dust dressing. These unobserving characters use their wind-

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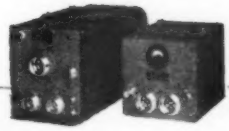

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mills to hurl sections of earth into her coffee urns and onto her butter pats with no thought of courtesy.

The so-called "private" pilot is just what his name implies, as often as not. It is his private airplane on his private airport, and he flies through his private air. Someone, and I hope I'm the guy, should tell him that an airport is as public a place as a hotel lobby or a garage, and that other people have just as many rights as he has.

Dusting falls under the above paragraph—and so do patterns.

A pattern, being a sort of public thing, like a highway, should be flown carefully even if, apparently, no other aircraft is within 50 miles. Why? Because even the most careful pilot hasn't 100 per cent visibility. Cutting the pattern, he's going to miss seeing that other airplane which is flying the pattern and aviation will get another damaged optic. Here at Alamo, the two-story cafe and sky room fascinate some pilots and they try to pat the roof affectionately with their wheels from time to time. Some day somebody is going to drop in unexpectedly.

Another heedless thing which some pilots do is to ignore weather reports. Any conscientious operator gets old before his time worrying about this chap. We are always more than willing to dash to the telephone and get the latest weather at destination for any visitor. We do so constantly, and often announce that the ceiling is 50 feet and visibility the length of a blind man's cane. Too often the intrepid pilot turns and says: "We've hit worse than that, ain't we, Joe?" If all the sweat boys like that have caused this operator to pour out were gathered together, the Martin *Mars* would have plenty of room to land in it.

Rentals to careless pilots are another headache. There is a type of mind which says: "So I rented the crate for an hour, didn't I?"

Responsibility presumably ends there. The pilot proceeds to a far off corner of the sky and wrings out a craft which wasn't built for wringing, perhaps weakening its primary structure. Or, perhaps, he notices that something isn't "working just right." Does he report this to the operator? To heck with it. So the next lad who rents the job has a forced landing or some other kind of failure. Here we find not only lack of consideration for the operator but an attitude which endangers the fellow-pilot.

Another item which falls under thoughtlessness is the too-common zoom on take-off, especially to delight friends who have come out to speed the daring flying-machine operator on his dizzy way. He's having a wonderful time.

The operator isn't. Period. A crack-up means a loss of patronage and the old fear of flying is back in the public mind.

Sure, we go all out for the pilots. We know that we have to. Common sense tells us that if we don't give service we're going to lose the gains we've made. So we have runways which are 3,000, 4,000 and 5,000 feet long, 400 feet wide. Soon, one is to be oiled. Pardon us for not doing it before but we're short on dough what with all the other expenses, from pilots' lounge to drinking fountains, from water pipes to showers, lavatories and telephones.

You ought to see the telephone bills Joe Birdman runs up giving his ETA to the little woman at the other end of the flight, making dates with the local girls, calling about weather and for other purposes. Too many times he forgets to pay.

In the meantime, Joe beefs because some airports don't have telephones.

It's amazing how many people can own $3,000 airplanes and still can't pay for gasoline, storage and repairs. It is also amazing to find out how many of these will take off unannounced one fine day, leaving a large bill, and go to some other airport to do the same thing.

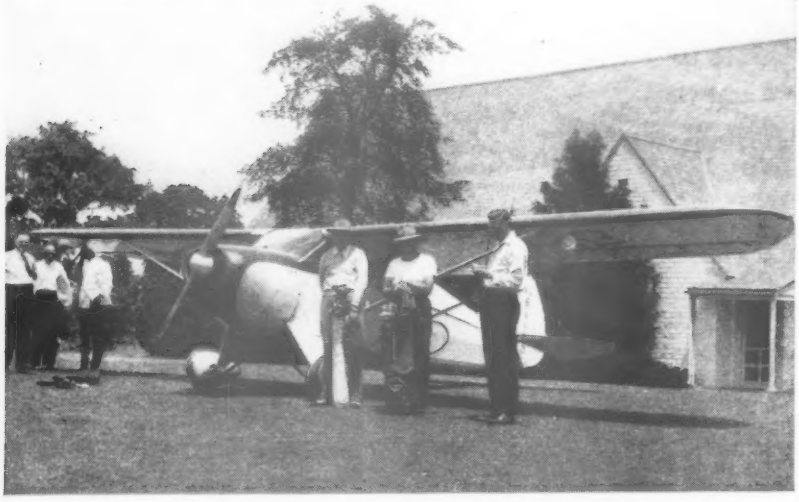
This is why many operators today ask for cash on the line.

One such pilot, who had left us under such circumstances, later blew a spark plug while flying over our field. He landed for repairs. My men made them. I presented him with his total bill and he blew up.

"What are you trying to do, break me?" he stormed. Yet he had owed me that money for over a year.

The oldtimers are all right. They've been on both sides of the fence and they know what the operator is up against. They are considerate of other pilots. They wince when they recall how they landed on cow pastures, hitch-hiked into town,

(*Continued on page* 82)



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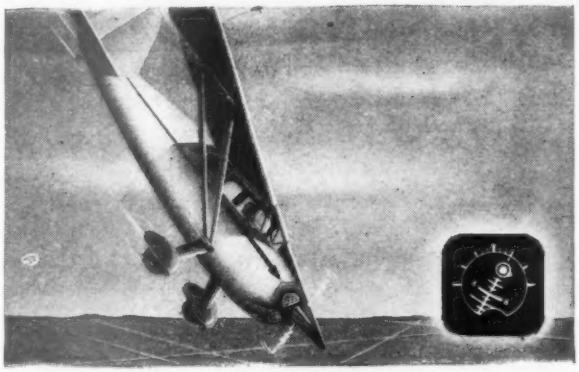

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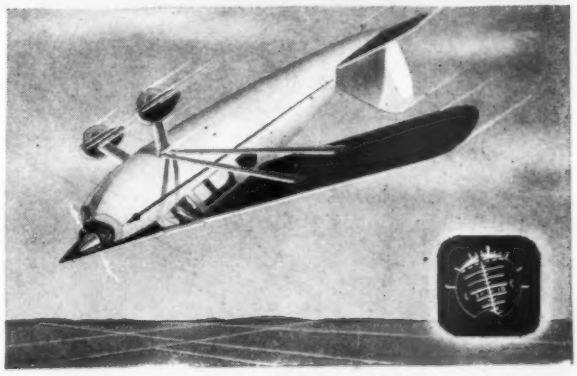

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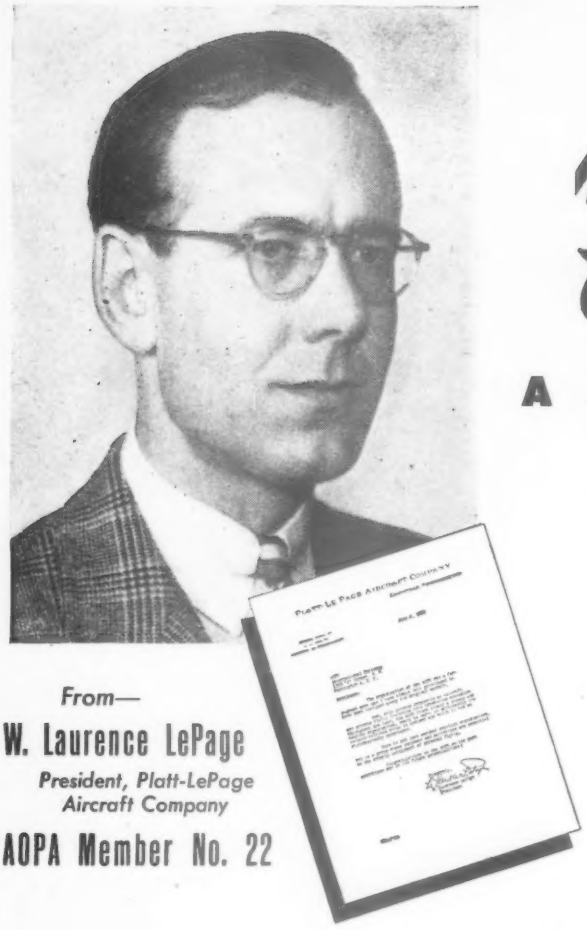

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PACIFIC AIRMOTIVE *corporation*

EXECUTIVE OFFICES: 6265 San Fernando Road, Glendale 1, Calif.

AND ITS AUTHORIZED SALES AND SERVICE DEALERS

(*Continued from page 78*)

brought back gas in five gallon cans and used natural surroundings for rest rooms. They realize how far we've come from that. New pilots take everything for granted and ask for more, not realizing that we're all in the same game together and are doing our best to make it better.

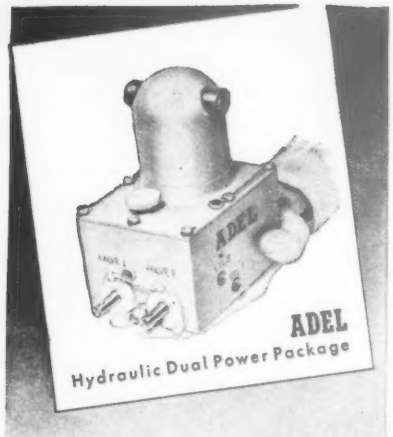
Some of these lads—and thank heavens they're in the minority—have such egos about their furnace-hot piloting, their daring and their charm that they fail to realize they aren't even wanted around. The operator breathes much more easily and adds years to his life when they pull up stakes and do their flying elsewhere.

It all boils down to something like this:

The operator must give service or, in the competition to come, he'll fall by the wayside. However, the newcomer to aviation, the "hot pilot," the thoughtless, heedless and inconsiderate fly—boy must accept responsibility, too. The pilot must realize the operator's problems, accept fair charges for honest service, pay his way.

Otherwise, there won't be any operator. No matter how much an operator loves the game, no matter how hard he tries to extend himself to the limit, he has to eat.

He'll fold, and find a business that gives better promise of feeding him. END



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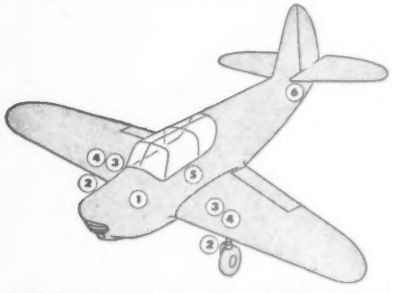

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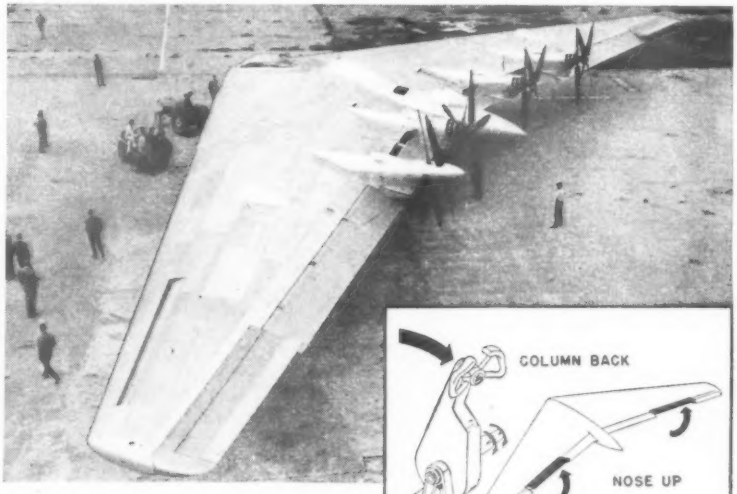
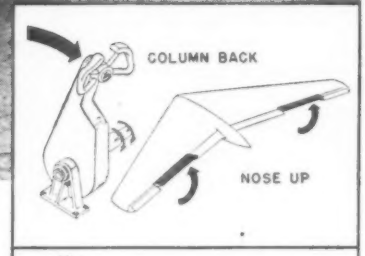


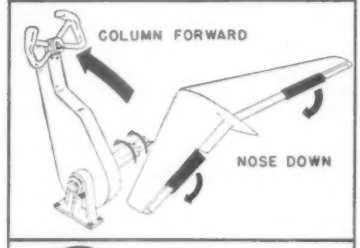
HOW 'THE WING' USES ELEVONS

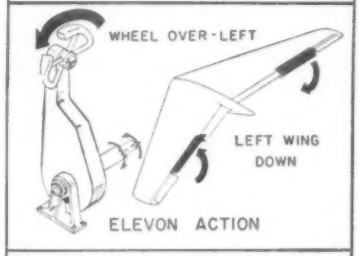
NON-LIFT control surfaces have been eliminated on "The Wing," Northrop's giant XB-35, by introduction of "elevons." The new elevator-aileron does not involve changes in the aerodynamic principles [See "I Flew 'The Wing'," September issue.]

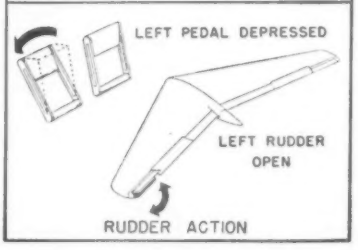
Elevons are located on the trailing edge of "The Wing" between its outboard engines and the split-type rudders at the wing tips. Diagrams at right show how elevon surfaces act as ailerons in turning flight, as elevators in climbing or gliding and as combinations of the two in co-ordinated maneuvers. Such combinations make possible infinite variations of effective control while eliminating parasitic drag of the conventional plane's non-lift controls.

It is apparent that the elevons form different angles with the flight path of the wing and, therefore, impose unequal air loads on the opposite ends. To compensate for this and to prevent yaw, the wing-tip rudders (specialized flaps) are designed to induce sufficient drag to equalize these differing air loads. Conventional flaps are built in between the engine units.

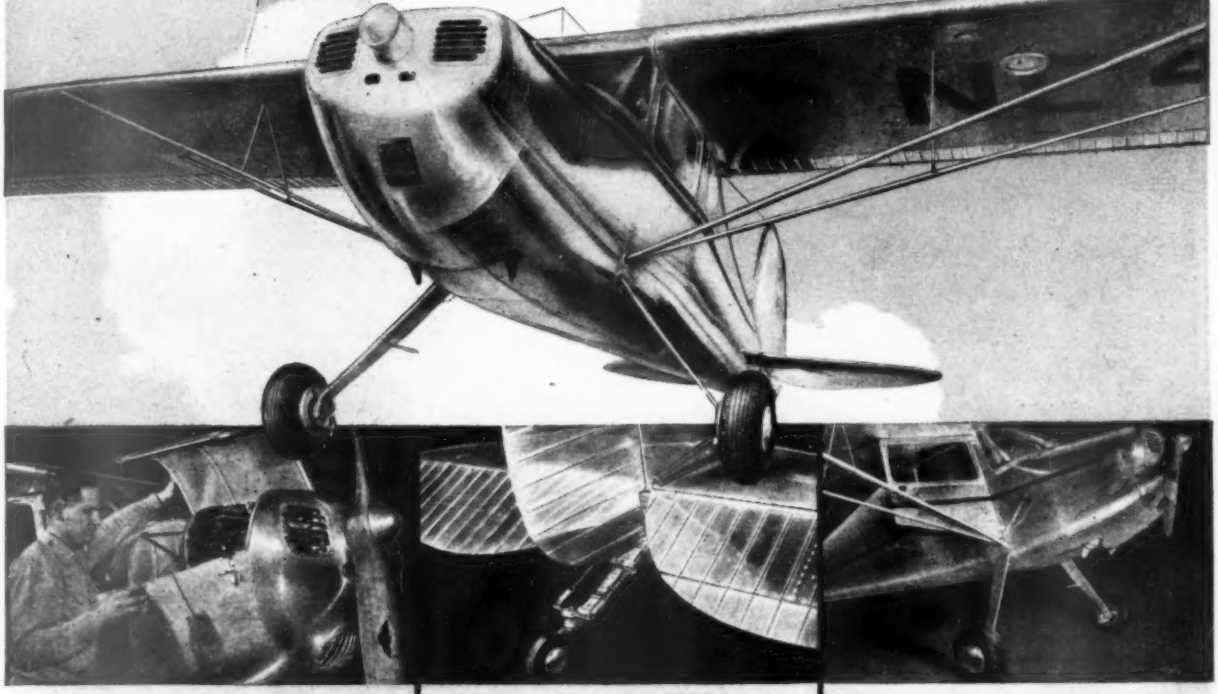








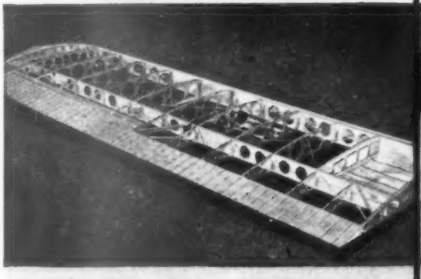
The plane facts prove that Cessna gives you *More for your Money*



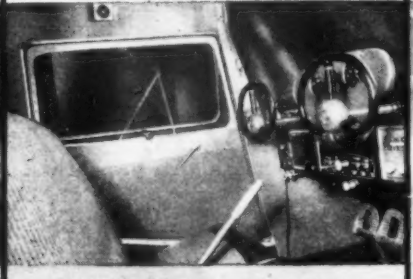
Not A Minute Wasted for engine checks. The top of the quick-service cowl opens on each side with 2 special, trunk-type, anti-drag fasteners. And the whole cowl is easily removed without touching the propeller.

Easier Taxiing in crowded areas, easier moving in hangars, with the steerable, full-swivel tail wheel. And it's one of several reasons why, on windy days when other light planes are grounded, you'll be up in a Cessna.

Exclusive With Cessna . . . a patented, safety landing gear that fairly floats you over the roughest fields jolt-free . . . that actually combats ground looping tendencies. And there are no moving parts to rattle or wear.



Year In, Year Out, all-metal structure stands up under all climatic conditions. Maintenance goes down to a minimum with all-metal structure . . . and, as every pilot knows, it gives maximum endurance and safety.



Instantly, Effortlessly, finger-tip control sets the full-range flaps to give you any desired angle of glide, making short-field landings easier and safer. They can also be used in quick take-offs from small fields.

You'll Go Farther . . . an easy 450 miles nonstop on 25 gallons of fuel in twin wing tanks. The Cessna is faster, too, with a top speed of over 120 m. p. h. Yet you ride in easy-chair comfort in the roomy cabin!

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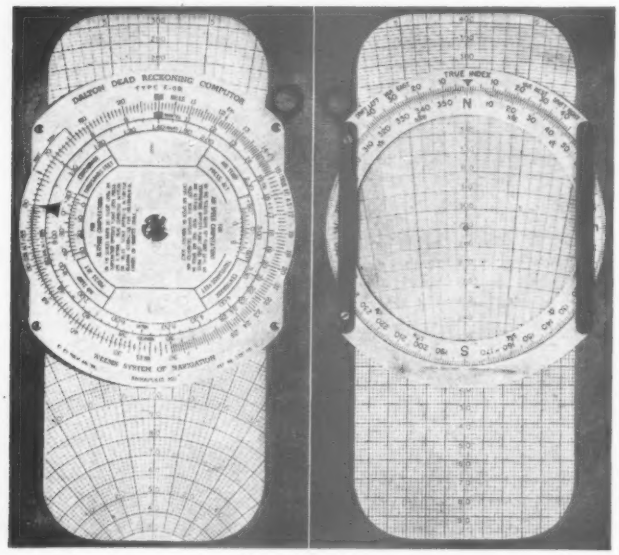

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AIR WSN WEEMS SEA SYSTEM OF NAVIGATION

ANNAPOLIS, MARYLAND

Aviation on the Campus

(*Continued from page 27*)

Seventy-five colleges—40 per cent of all those listed—offer courses leading to a degree in this subject, though some are offered as an option to the regular mechanical engineering degree. The two-year courses indicated serve as the regular first two years of a four-year course and proper credit is given therefor.

One of the surest signs of the vital part aviation is going to play in the lives of future graduates is the great number of institutions offering courses leading to a private license. Ninety-eight colleges, or 50 per cent of those listed, have programs leading to such licenses. Many colleges have contracts with nearby flying schools where the actual flight instruction is given. The University of Illinois, Purdue, and Middle Tennessee State College have their own airports, indicating an increasing trend in that direction. Middle Tennessee, incidentally, offers 18 quarter hours in aviation under scholarships paid for by the Tennessee Bureau of Aeronautics. Louisiana State University is planning its own airfield and will have courses in flight instruction upon its completion.

Seventy-one of the 98 colleges giving courses toward a private license also offer those leading to the commercial license.

Additional courses leading to an instructor's rating are given by 43 universities and to instrument ratings by 24. Two colleges, Presbyterian Junior College and Northwestern State College, also give the aircraft and engine mechanic's rating.

The University of Illinois and Bowdoin College offer advanced training in every one of the 22 courses covered by the questionnaire. All but two are offered by the University of Southern California and Purdue University. A very complete aeronautical course is given by Northwestern State College, including instrument flight problems, fixed base operations and airway traffic control.

Other extensive instruction is offered by Alabama Polytechnic Institute, California Polytechnic School, Sacramento College, Wichita University, Ohio University, University of Cincinnati, Oklahoma Military Academy, University of Oklahoma, Pennsylvania State College, University of Pittsburgh, University of Texas, West Virginia University, and the University of Denver.

The categories listed in the accompanying summary table cover most of the courses offered but a few additional courses are given in some instances. Ohio University has a course for airline hostesses. Billings Polytechnic Institute and the University of Georgia offer courses in parachute packing and rigging. A two-year terminal course in aircraft maintenance now is included in the North Texas Agricultural College curriculum.

Two schools, Princeton University and Middlebury College, indicate that while no college-sponsored program is under way, strong campus flying clubs are organizing such instruction. Bucknell University has plans for an extensive aeronautical curriculum at the earliest possible date and possesses, meanwhile, an air-minded faculty—the president and a professor are co-owners of a plane; the college physician owns one, another professor owns two.

Of the 1,700 colleges covered by the questionnaire, 50 of those schools large enough to have rather extensive aeronautical curricula did not answer the initial questionnaire or a follow-up query. These 50 were then checked against a similar survey made in 1944 by the American Council on Education in cooperation with the Civil Aeronautics Administration. It was found that 15 of the 50 were, at that time, offering some aeronautical courses.

Those 15 are American University, Washington, D. C.; Clarkson College, DePaul University, Detroit Institute of Technology, University of Houston, Indiana University, University of Louisville, Loyola University of Chicago, University of Miami, Coral Gables, Fla.; Miami University, Oxford, O.; St. John's University, Tufts College, Tuskegee Institute, Utah State Agricultural College, and Wayne University. Their 1946 curricula, of course, are not known for the reasons stated.

Perhaps the most significant comment from the schools not giving aeronautical courses is this from one slightly miffed teacher: "No such course is given—and for no good reason." END

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Report from Washington

(*Continued from page 51*)

ment. Russia is currently refusing to permit any air operations over the Balkans except those conducted by the Russian-Balkan monopolies on a 20-year contract basis.

Thus PAA's certificated route stops at Vienna, where the Russians greeted the inaugural flights by posting sentries to keep Americans from traveling the best road from Tulln Airport to Vienna. Even the ATC, America's foot in the door in Balkan operations, was so encumbered by Russian red tape that flights were reduced to a minimum.

Real significance lies less in the isolation of the Balkans than in the isolation of Turkey which, as a principal portal of the Middle East, is reported to be most anxious for U. S. air operations. That PAA cannot operate through Prague, Budapest, Bucharest means it cannot get to Istanbul and Ankara. A detour via Rome and Athens is possible. It's an unhappy setup regardless of how you look at it.

What Next?

Atomic propulsion, safe flight at speeds from hovering to several times the speed of sound, unlimited range in terms of world distances, and travel into outer space may be possible during the next three decades, Engineering and Sales Vice-President Wellwood E. Beall declared recently during the 30th anniversary celebration of the Boeing Aircraft Company.

Beall believes that such things as safe flight regardless of weather conditions, natural color televised navigational aids, fool-proof personal aircraft, and completely automatic controls could be realized in the next 30 years of aviation advancement.

Beall's predictions were predicated by a big "if."

Such advances—and others even more startling—will be possible, Beall declared, "only if the governments of the world can manage somehow to live peaceably together, if the tempo of research does not falter in the years to come, and if the continued awareness of the American public to the tremendous importance of aeronautics does not lag."

Summer Doldrums

Sen. Hugh Mitchell is expected to get further action on the Air Policy bill when the new Congress convenes in January. . . . The nation's capital fears a possible materials shortage—especially aluminum and steel—in the autumn. . . . The Aircraft Industries Association has organized a helicopter committee to give the whirlybirds a break . . . the AAF got its requested budget of $14,000,580 for industry mobilization. Nearly $12,000,000 will be used in placing 34,285 all-purpose tools in permanent storage while the rest will be used primarily for industrial studies and preparing for intensive production efforts when needed. . . . Now they estimate nine months for tooling up instead of the original six-months upon which earlier releases concerning production schedules were based. END

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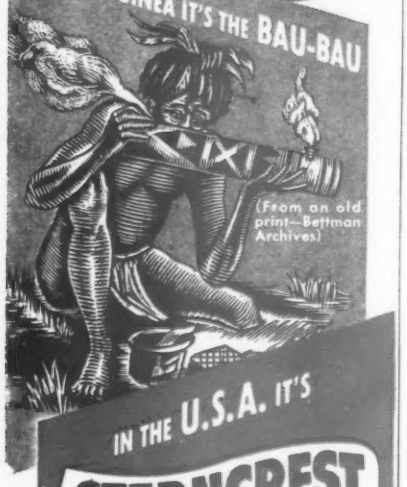

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'Copter College

(Continued from page 33)

mechanics I went to the Sikorsky aircraft factory in Bridgeport, Conn., to learn flying and maintenance of the craft from the manufacturer's experts. By March, 1944, we were ready to teach our new knowledge to others and were ordered to open a school at Freeman Field, Ind. Lieut. Norbet T. Guttenberger and I took off with two helicopters and flew to the Indiana field. With the original crew and these 'copters, school was opened officially.

The helicopter program began having growing pains almost immediately and by December, 1944, we had to move to Chanute Field, Ill., and larger quarters. By now we had 16 helicopters and a proportionate increase in pilot-instructors and groundcrewmen.

By the following May, four more 'copters had been delivered and we outgrew Chanute. Again orders came through and we moved "in the largest mass helicopter cross-country flight" to the training base at Sheppard Field, Tex. The group is now at San Marcus, Tex.

At Chanute and later at Sheppard the routine of training pilots became more or less standardized. With the exception of Maj. Gen. Frank E. Lowe, executive officer of the Senate's Meade Committee, students were graduate fixed-wing pilots. With few exceptions, they were all under the rank of captain.

In seven weeks we turned our students into graduates of the "Kollege of 'Kopter Knowledge." They accumulated 70 hours of ground instruction and from 32 to 35 hours of flight time.

The first week at school was spent on ground orientation programs and motion pictures which gave the students a basic idea of rotary wing aerodynamics.

Actual flying began the second week and the students slipped into the routine which continued until graduation. Half a day was spent on the flight line and the other half in ground school. On the ground, special emphasis was placed on maintenance for we knew that few helicopter pilots would be stationed near trained helicopter mechanics. In many cases the pilot would have to be his own crew chief.

On the ground, the students learned the theory of flight, including the history and comparative analysis of rotary wing and fixed wing aircraft, and were soundly drilled in problems directly related to helicopter design and flying. They also had to brush up on their radio training and learn to operate the code signal lamp at a rate of five words per minute.

Flight training was divided into five phases: pre-solo, five hours; intermediate, 10 hours; advanced, 10 hours; precision, five hours; and night flying, two hours. This adds up to 32 hours although a 35-hour maximum was allowed.

No student could solo in less than five hours and we set a maximum of eight hours on pre-solo instruction. There has been much discussion about how long it takes to make a helicopter pilot. One lieutenant colonel said that anyone could learn to fly a helicopter even if he had never flown before, in 10 hours. I don't know about that, but our men learned enough to solo in an average of from five to six hours of instruction.

Flying fixed-wing aircraft undoubtedly is some help in becoming a 'copter pilot, but in one case we had to fail a man who couldn't adjust his reactions to helicopter flying—and this man had been flying airplanes for 23 years!

Step by step, here was the program adopted for the Army helicopter students:

Pre-solo phase was a dual instruction period of five hours in which the instructor taught starting procedures, use of the controls, hovering (remaining in one location without any horizontal or vertical

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movement), forward flight from a hovering position, forward flight to hovering, and landing.

Probably the most difficult thing for the new student to learn is to hover and to stop the aircraft in mid-air. In these two maneuvers the student must carefully blend his throttle, rotor pitch and stick and rudder controls.

Soloing at the end of the pre-solo phase of training is a strange procedure for those new to helicopters. The instructor steps out of the helicopter's cockpit and tells the student to "take her up." Until he is convinced that the student can handle the 'copter, the instructor doesn't let him fly it more than 30 feet from the take-off spot. Three times the student pulls off the ground, hovers and then lands. If the three flights—possibly to an altitude of eight feet—are successful, the instructor gives him an okay to fly around the pattern and make three approaches and landings.

In the intermediate stage, the student again learns the principles of the pre-solo stage and takes up sideward and backward flight. He learns to maintain a constant altitude, direction and speed and, in addition, the steep turn, cross-wind take-offs and landings, jump take-offs and autorotation.

Jump take-offs are made by obtaining maximum rotor r.p.m. and then increasing the pitch of the blades until the helicopter hops into the air much like the take-off of an autogiro.

Autorotation is an emergency procedure which permits the craft to land in the event of engine failure. These "forced landings" call for the student to disengage the engine from the rotors. The blades then will revolve by themselves. Concentrating on keeping the craft headed into the wind and keeping proper air speed, the student settles until about 50 feet off the ground. Here he does a "flare-out" by coming back on the stick, increasing the pitch of the rotor-blades, engaging clutch and advancing throttle.

In an actual forced landing the procedure would be the same but the "flare out" would be accomplished, naturally, without the use of the engine. Several practice and a few emergency landings have been made this way without injury to personnel or helicopter involved.

In the advanced phase, the student learns to make spot landings on a five-foot "bull." During these landings a constant rate of let-down and angle of approach is emphasized. The purpose of this maneuver is obvious—to land the helicopter in places in which very little clearance is available.

Another maneuver taught in this training phase is the 360° hovering turn. In this the helicopter remains at a constant altitude over a fixed point and maintains a constant rate of turn. This maneuver is done, incidentally, at an altitude of between five and eight feet.

When teaching a fixed-wing pilot a "quick stop," the instructor has to watch the student closely. Almost without fail the student experiencing his first quick stop will grab for anything and everything in the cockpit—the sensation is something like riding a bronco. In this

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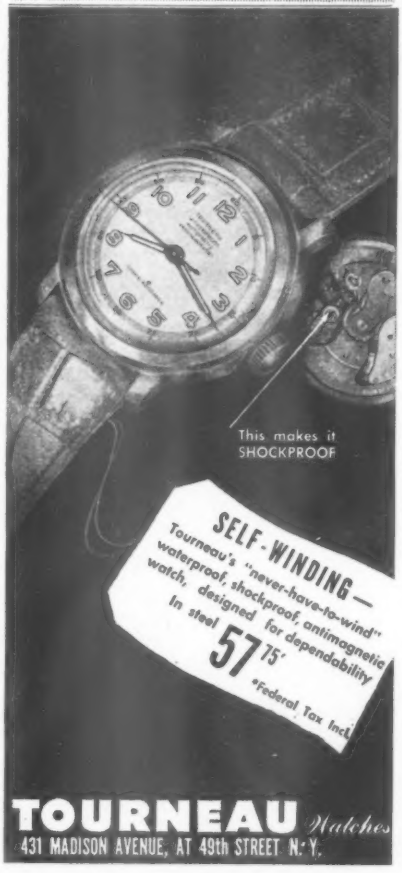

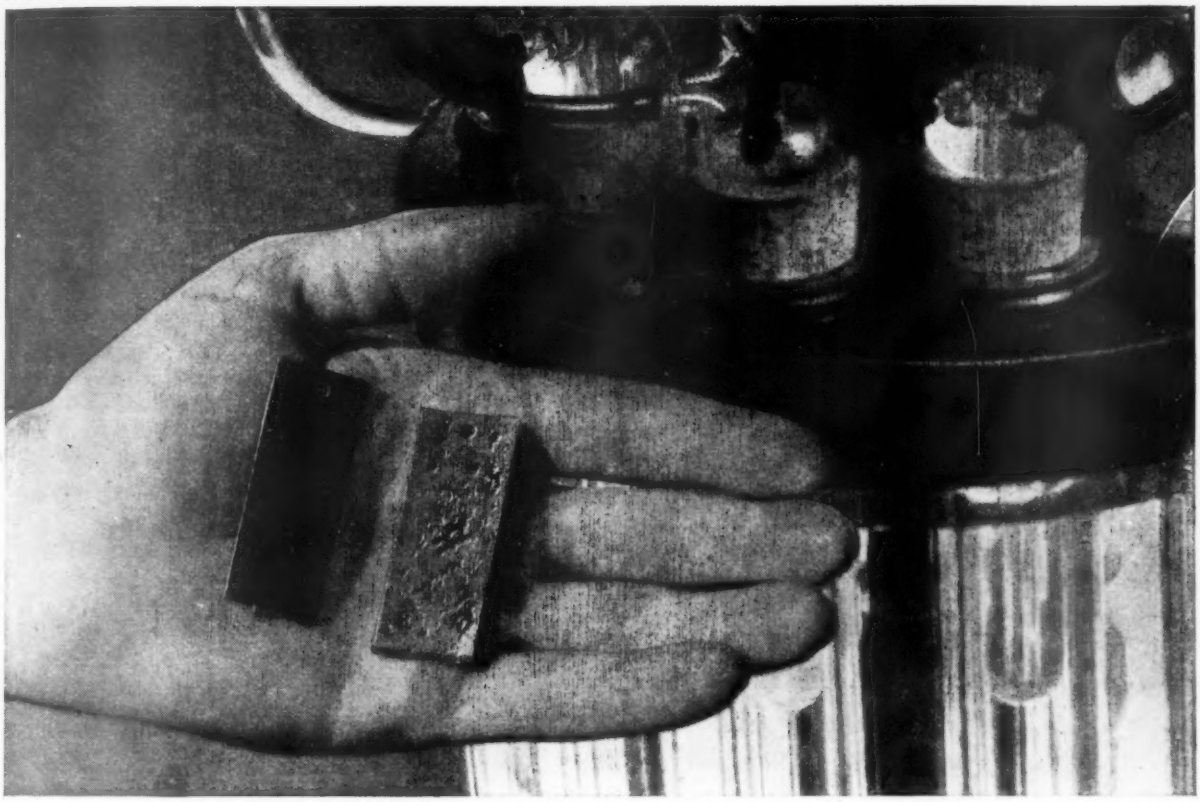

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maneuver the pilot skims the ground at 50 feet at 50 m.p.h. approaching the target. He then decreases pitch and throttle and comes back on the stick. The 'copter's nose cocks high in the air as the aircraft stops. Proper rotor pitch and power is applied to keep the helicopter hovering. This maneuver is taught as a defensive measure to disrupt the aim of an attacking fighter. These stops, incidentally, are faster than those of a car on a concrete highway.

The student who has made normal progress should now have about 26 hours and is ready to enter the precision phase. He learns to fly a "square box," play "stick and ring," "matchbox," and do precision hovering.

Square box calls for the student to keep his craft pointed in one direction while flying a 50-foot rectangle laid out on the ground at eight foot altitude. To do it, he must fly sideways, backwards and straight ahead.

Stick and ring is a much publicized maneuver in which the pilot spears a ring held by someone on the ground with a stick jutting from the front of the cockpit. The student has to pick up the ring, back off and then fly forward and put the ring in the ground man's hand.

In "match box", the student makes take-offs from restricted or short field areas and maintains a maximum climb at the best possible air speed.

In precision hovering, the student is required to handle the helicopter almost by instinct as he looks over the side and behind him at a wheel which must be kept a few feet over a fixed point. This is one of the most difficult maneuvers for any helicopter pilot.

Night flying, the final phase of training, impressed upon the student that in cases of emergency and under certain conditions he can make night flights. However, this course was not of long duration as there are not as yet adequate night flying instruments. Night flights were made from the main runways with all fixed-wing flying suspended. To aid the helicopter pilots make their landings, all field runways lights were extinquished and a series of colored lights substituted.

Having passed his five phases of training, the student was pronounced a full-fledged graduate of the Kollege of 'Kopter Knowledge, complete with diploma. It reads: (He) "having remained motionless in space, flown forward, backward, sideward and vertically, without serious consequences, is awarded this certificate . . ." I, as "Chief Rotorhead" would sign it. END

How to Swing Your Compass

(*Continued from page* 50)

point the plane north, and step out to align it with north.

You will need a master compass. If one isn't available, take an ordinary aircraft compass and remove all the correction from it by neutralizing the screws. It might be a good idea to check it for accuracy, first, on a known heading. Once checked, you can use it as a master compass.

Using the master compass, stand behind the plane and sight along the aircraft. Move the plane until it points in the same direction that your master compass reads as magnetic north.

Now step into the cockpit and, with a *brass* screwdriver, neutralize the NORTH-SOUTH set screws of the plane's compass so that these screws will align with the little white dots on the compass' face. There will be an error in the compass reading now, caused by the magnetic attractions of the plane. Correct these with the brass screwdriver by moving the N.S. screw in the proper direction, until the compass points to 360°.

Now swing the plane to a due magnetic east heading determined by the master compass. As in aligning the plane in a north direction, you must step out of the plane to determine the correct heading. Then step back and neutralize the compass, this time using the EAST-WEST set screws, until the plane's compass points due east, or 90°.

In the south and west headings the procedure is different. In the first place, do not neutralize the compass. Leave the set screws in the same positions. You will have noticed that in the north and east headings all the error in those headings was removed. In the south and west headings you do not take out all the error. You take out only ½ the error. For example: the plane is facing south and the compass reads 184°. This is a plus 4° error. This error must be distributed between the north and south headings. It must be so distributed because you have already removed all of the error in the north

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152-E2

heading. To remove all of the error again in the south heading would be putting back everything you took out and you would have accomplished nothing. Thus, by turning the screw marked N-S until the compass reads 182° you distribute the error between the north and south headings and accomplish your objective. This very same procedure is followed in the west heading.

The general rule in compensating a compass is: *take out all the error in the north and east headings, but only one-half the error in the south and west headings.*

The actual compensating of the compass is accomplished. Now, the compass must be swung. By means of the master compass, again have the aircraft face north. The plane compass reads 1° On a sheet of paper jot this fact down. Go through this procedure every 45°, around the entire compass. When you have finished your work sheet will look something like this:

Master Compass	Plane Compass	Error	Master Compass	Plane Compass	Error
North	1°	+1°	180°	181	+1°
45°	44°	−1°	225°	229°	+4°
90°	87°	−3°	270°	272°	+2°
135°	133°	−2°	315°	314°	−1°

From your work sheet you now have sufficient data to compile a compensating card. This card, when completed, should be placed near your compass and used during flight. The following is a simple-type compensating card:

Compensating Card
Compass swung 6-15-46
By J. M. Jones

For	Steer	For	Steer
North	359°	180°	179°
45°	46°	225°	221°
90°	93°	270°	268°
135°	137°	315°	316°

If you are not satisfied with 45° headings, you can break it down to 15° or 30° headings, whichever you prefer. This can be accomplished by using the facts you have already compiled. All you have to do is make up a graph incorporating the facts you have compiled and correlating them in the following manner:

You will notice that the dots were placed on the headings obtained from the compass swing. There are nine dots in all, but by connecting them, a curve is plotted. From this curve, it is possible to get the compass error for every 15 or 30° instead of the 45° already illustrated.

If you happen to live in a country where the section lines of fields are laid off pointing toward magnetic north and east it is a good idea to go aloft. Align the plane along these section lines and while holding it on a steady course have an assistant align the compass in relation to the section lines. This last correction, ignored in correcting many compasses, gives the most accurate compensation possible. It is also a good means for checking any compass. END

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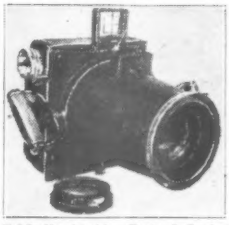

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Week-End Warriors

(*Continued from page 44*)

and their families, while Earling practices the exacting arts of aerial warfare. The training session will be one of 48 he'll log during the year, usually on Saturdays or Sundays. In addition, he'll arrange his vacation so that he can put in an intensive two-week training stint at a coastal base or aboard a carrier. In all, he'll log better than 100 hours of flight a year in maintaining his proficiency in combat maneuvers, bombing tactics, aerial gunnery, radar search, interplane communications and carrier-based operations.

Zaeske will be paid for each of the week-end drills 1/30 of the monthly amount to which his commission as lieutenant would entitle him in the regular Navy, plus an additional 50 per cent in flight pay. For the two weeks of carrier-based operations or coastal-station service he'll get one-half month's pay, plus 50 per cent flight pay. In short, the reservist's pay for the year approximates two months' pay for whatever rank or rate he holds. For Zaeske it all adds up to $629.50.

The Navy considers the investment a far-sighted economy. It requires fully two years and costs up to $30,000 to develop a skilled combat pilot. Disregarding the initial training costs, there may not be two years in which to prepare for the next war. That's precisely the reason why these "minutemen" of the Naval air arm are so important—they are the "second team," ready to back up the men on active duty. Almost without exception they are the best men available.

From an estimated 55,000 applicants—all volunteers—the Navy hand-picked 27,700 trainees. That force includes 6,100 Navy and Marine pilots (young pilots with the most recent fleet experience), 2,800 ground officers, 18,800 assorted crewmen (machinists, communications specialists, gunners, radar operators, and others for supplementing squadrons of the active and reserve fleets). Each of these men is a specialist who, in most cases, has had plenty of experience in the heat of actual conflict.

Again the men pictured here are typical. Turn back to page 43 and take a look at them. Lieut. C. E. Standard got the Navy's highest award, the Navy Cross, for his attack on a Jap heavy carrier, and the Air Medal for a bombing photographic flight over Yap. Lieutenant Zaeske holds the D.F.C. with two stars and the Air Medal; Lieut. Comdr. J. A. Thvedt, the D.F.C. with two stars and the Silver Star, and Lieut. F. T. Gabriel, the D.F.C. and the Air Medal with two stars.

When these men report for duty at the Glenview base, they find much the same sort of air organization as those set up at the 20 other bases selected for Air Reserve training. There are two large (CVG) carrier groups, plus two escort carrier groups and a patrol bomber group. Each station also bases two Marine fighter-bomber squadrons.

Air Reservists fly the latest types of Naval planes—fighters, bombers, patrol planes, trainer and utility planes. All new models are made available to the Air Reserve as soon as they come into general use in the regular Navy. Modern training aids, equipment and devices are assigned to the Air Reserve stations—Link trainers, radar equipment, navigational gear, and training aids related to all other flight instruments.

Each air station is manned by 500 stationkeepers who maintain both station and aircraft in top shape for use by reserve pilots. Social and recreational facilities at all stations are open to reservist's families, a Navy gesture that allows a week-end warrior to salvage some spare time for normal relaxation.

Visit any of the 21 bases on a Saturday or Sunday and you'll find these "minutemen" hard at work in a program designed to keep "hot pilots hot" and to weld air and ground crew veterans into a "trained reserve of air groups ready to go into combat on 10 to 30 days' notice." What's more, you'll find a spirit of camaraderie indicating that morale is high. END

FLYING

"Old McClimans would forget his parachute if it wasn't fastened on!"

After hours, when aviation men talk shop, you'll sometimes hear them speculate as to what inventions or developments have meant the most to aviation progress. High on anybody's list should come modern high-octane gasoline . . . and the more powerful, more efficient engines that this gasoline has helped make possible. Many an increase in speed, range, payload, or ceiling has resulted from the improvement in the antiknock value of the fuels made available by oil refiners.

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The Seabee

(*Continued from page 38*)

and that's precisely where the pay-off will come. Fred Marchev, in other words, is in one of his most expensive gin-rummy games yet, and he knows it. He's got millions invested in the design and he has to sell something like 5,000 airplanes before he begins to cash in on his all-out gamble.

Now that I have flown the *Seabee* I'd be inclined to go along with Marchev's gamble. He's got just exactly what he said he'd have, nothing more or less. Nothing flashy; just more airplane for your nickel than you've seen in a long time.

There's plenty of leg room for all passengers, especially in the front seat. The seats are comfortable enough for its maximum range of 560 miles. Cabin appointments are quite enough for the money, but they are not plush. The cabin is noisy at crusing speed, but not seriously so. Most of the noise is due to the fact that the big engine turns over quite fast (2,350 r.p.m.) to deliver cruising horsepower.

One of the *Seabees* I flew for this article—NC-87456—took off the runway at Farmingdale in 10 seconds, without flaps and carrying a gross weight of 2,830 pounds (320 pounds under maximum). We climbed the first 1,000 feet at slightly over 600 f.p.m. Altitude of the airport is 68 feet above sea level; the temperature was 80°, altimeter setting 30.10, and the wind 15-18 m.p.h. The *Seabee's* best climbing indicated air speed, according to its engineers, is 70 m.p.h.

Lowest stalling speed I could get with gear and flaps down was 55 m.p.h. indicated. With gear and flaps up it stalls at about 65. This seems a bit high, particularly in view of the fact that the *Seabee* normally is landed at about 58 m.p.h., which is only a fraction less than 57 per cent of its cruising speed.

REPUBLIC SEABEE SPECIFICATIONS

Approved Type Certificate No. 769

Engine	215-h.p. Franklin
Wing span	37 ft. 8 in.
Length	27 ft. 10¾ in.
Height	10 ft. 2 in.
Gross weight (normal)	3,150 pounds
Gross weight (utility)	2,810 pounds
Empty weight	2,164 pounds
Top speed	112 m.p.h.
Cruising speed @ 75% h.p.	103 m.p.h.
Landing speed	58 m.p.h.
Maximum range	560 miles
Service ceiling	12,000 feet
Fuel capacity	75 gallons

Source: Republic Aviation Corporation

The *Seabee* will deliver an honest 100-m.p.h. cruising speed, and 102 m.p.h. under ideal conditions. At that speed the engine burns about 13 gallons per hour; its 75-gallon capacity gives the *Seabee* over five hours range. It won't carry four people with baggage, plus all that gas. The pilot must compromise the load he can carry against the distance he must fly non-stop. He has a wide latitude with the *Seabee*, being able to trade payload for fuel or vice versa.

In cruising flight the *Seabee* has excellent visibility, especially forward and to each side. It is easily trimmed with the elevator trim tab which is operated by a conventional crank handle in the cabin roof over the pilots' seats. Early production models of the *Seabee* have an unbalanced elevator which is a little difficult to operate with the control wheel. Later models will have a counterbalanced elevator.

Maneuverability is quite good, with plenty of aileron available at both cruising and minimum speeds. With flaps down, the glide path is fairly steep but easily controlled; visibility and control during the landing is excellent.

The *Seabee* is at its best on water. Its possibilities when used as a flying boat are its most attractive selling points. It is ideal for the flying sportsman—the pilot who loves the outdoors is not satisfied by either the landplane or seaplane and cannot afford a Grumman *Widgeon*. Republic has gone all out in that respect. The large door on the right-hand side of the nose can be opened to make the *Seabee* into an excellent platform for fishing or swimming. The backs of the two front seats can be hinged backward, making two full-sized beds.

The hull is rugged and has been designed so that its water-tight compart-

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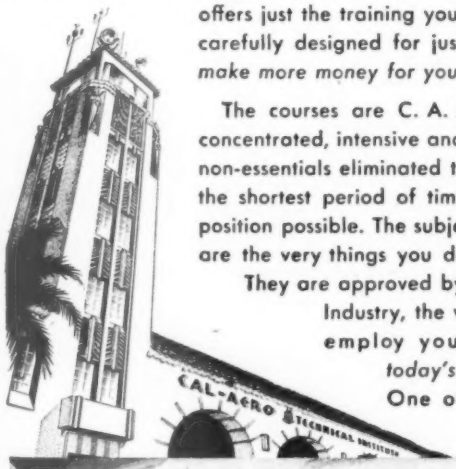

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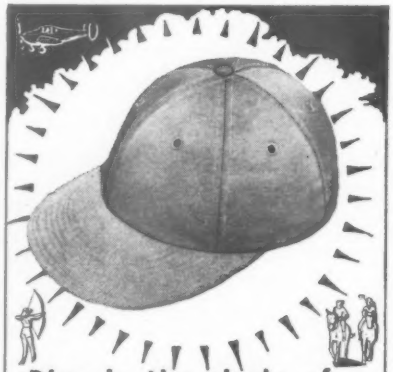

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ments can be drained easily and quickly. Having one of Republic's test pilots demonstrate the *Seabee* on the water is enough to convince the sourest skeptic. I have "landed" the *Seabee* 20 feet above the water; the resulting splash could only have been taken by a thoroughly-stressed, excellently-engineered hull. Several hull landings have been made on runways, with only slight scratches on the keel.

It is on the water, however, that many *Seabee* owners are liable to have trouble—especially those who have never flown seaplanes or sailed boats. Once on the water the *Seabee* becomes a sailboat—and the pilot had better know how to sail. One gadget will help the amateur tremendously: the reversible Hartzell propeller. It costs $350 extra, however. But with that propeller, the novice can quickly learn to get himself out of trouble while maneuvering on water. Anyone, for instance, can soon learn to ease up to a dock or rocky shore with the reversible propeller. You simply set the throttle at 1,000 r.p.m., then work the overhead pitch control backward or forward. Nevertheless, the *Seabee* must be handled with care on the water. Republic pilots estimate that an amateur without experience on the water should have 10 hours of dual instruction before operating the *Seabee* as a flying boat.

On land or water, the *Seabee* has excellent maneuverability. On land, the tail wheel can be locked and the plane steered with the toe brakes. On water, the rudder pedals operate a water rudder directly behind the retracted tail wheel.

Both landing gear and flaps are controlled by a single hydraulic pump handle on the floor between and ahead of the two front seats. Selector valves enable the pilot to operate flaps or gear; both cannot be operated together. After a land take-off, it takes about a dozen pumps of the handle to retract the gear; only a few are needed to lower the wheels. The flaps take relatively fewer pumps and are easily extended or retracted.

Only warning device on the landing gear is a pair of small dash lights, one red and one green. Should the pilot become so engrossed in an approach to an airport he forgets to look at the lights, the chances are good he'll find himself sliding down the runway on the *Seabee's* keel. All things being equal the damage should be negligible, but the airplane could handily use a gear-warning horn of some kind.

The *Seabee* has its A.T.C. in two categories, normal and utility. Normal gross weight is 3,150 pounds, utility gross, 2,810. Useful load in the normal class is 986 pounds; in the utility category it is 646 pounds. Wing loading in the normal class is 16 pounds per square foot.

The *Seabee* will spin, but you must fly it into a spin. It has good stall characteristics, giving plenty of warning before it drops its nose straight ahead. The airplane should not be stalled as close to the ground as might be comfortable in smaller private planes. When the *Seabee* stalls it settles very fast. Normal landings usually are made with power on.

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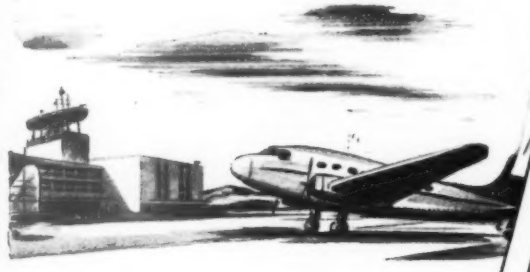

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way Hallicrafters radio, fixed-pitch propeller, dual controls, compass, altimeter, air speed indicator, and a standard Stewart-Warner engine-instrument group.

Fred Marchev apparently has done what he said he would. The *Seabee* has its A.T.C., radical structure and all. Marchev had to buy an engine company, crack the whip over a lot of conventional-minded engineers, stake millions of Republic dollars and still meet a sizeable payroll. Now he has got to hit his goal of 40 *Seabees* a day, hoping all the time that his customers will have as much faith in his little amphibian as he has.

—MAX KARANT

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1. Name, rank and serial number
2. Service address
3. Home address
4. Date and location of incident
5. Description of incident
6. Signature of applicant
7. Signature of commanding officer

A listing of the Club members, a regular feature in preceding issues, is continued below:

271. James, Donald C., N
272. Nelson, Wayne E., N
273. Stubblefield, Dick L., N
274. Beattie, Robert S., N
275. Henderson, Lloyd A., N
276. Smith, D. W., N
277. Van Blaricum, G. J., N
278. McGrath, V. A., N
279. Russell, J. B., N
280. Bennett, Warren N., N
281. Webster, Howard M., N
282. Hine, Thomas L., N
283. Hougland, Herman R., N
284. Higgs, Joseph W., N
285. Garchow, Dennis L., N
286. Bishop, Paul D., N
287. Kuykendall, Andrew L., N
288. Morgan, Willard D., Jr., N
289. Stice, Jake N., N
290. Kenyon, Howard R., N
291. James, R. E., N
292. Dillard, C. L., N
293. Cuneo, F. L., Jr., N
294. Wilson, D. L., N
295. Regester, R. P., N
296. Woodson, W. H., N
297. Ruzicka, L., Jr., N
298. Nelson, L. J., N
299. Kaiser, J., N
300. Jones, H., N
301. Pool, C. J., N
302. Elliott, T. W., N
303. Rumrill, G. F., N
304. Rinkler, G. H., N
305. Hill, J. J., N
306. Linquin, R. E., N
307. Mitchell, W. J., N
308. Zarwell, E. L., N
309. Stoll, D. R., N
310. Salyard, R. J., N
311. Wright, W. F., N
312. Lacy, A. J., N
313. Scussel, R. R., N
314. Hancock, W. W., N
315. Smith, D. H., N
316. Woellhof, L. R., N
317. Herring, John J., N
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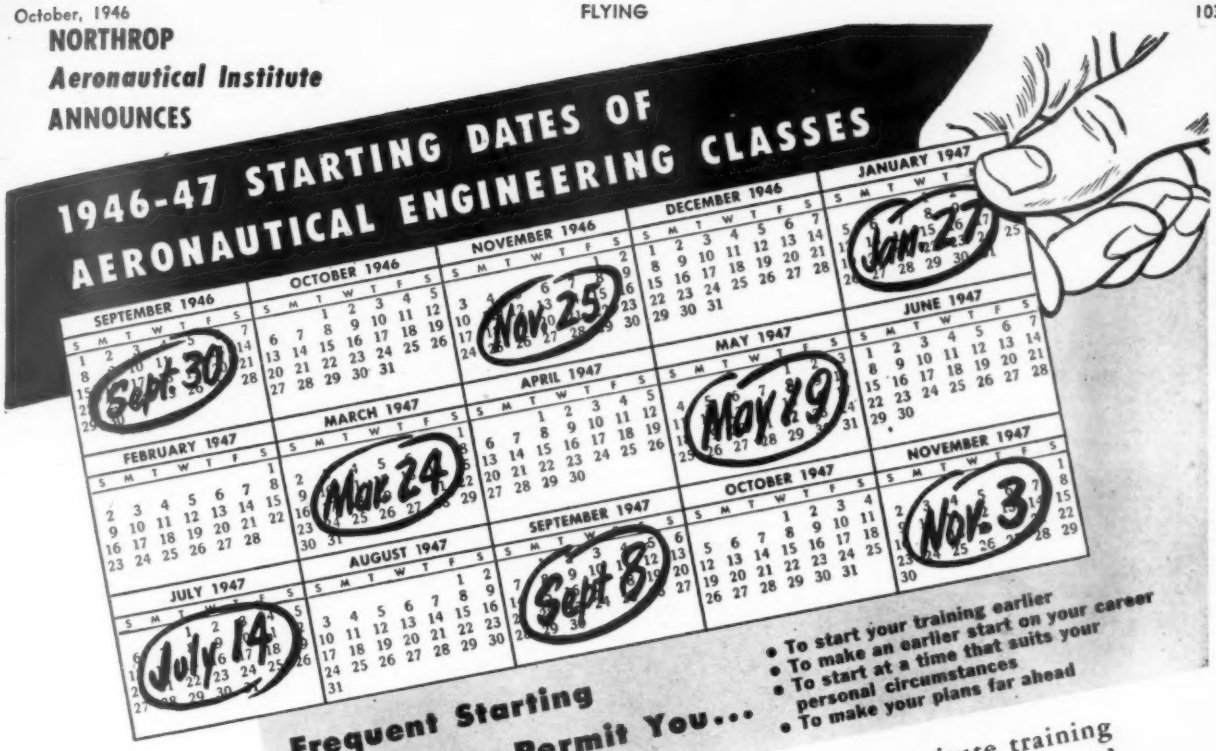

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Letters

(Continued from page 6)

I am no great-shakes at this flying business, but I will lay five bucks on the line, that seven out of 10 certificated instructors will vote that this pilot better take some more dual.

These are the points at issue:. . . "I was about 175 feet off the ground . . ."

Sounds like pretty fair altitude in which to make an emergency steep turn.

" . . . I made my decision, pulled the nose up almost to the stall point, threw the aileron full left, held a little top rudder and actually attempted to pivot about my wing tip."

"Whew! That's the most sadistic way I can imagine for a fellow to quit flying. My old instructor said "full aileron" near the stall is strictly not cricket. Seems such a situation, in itself, might cause a bit of wing-tip stalling. But, is he satisfied? No, he adds a little top rudder and expects to "pivot on his wing tip." I think it's correct to say, according to the principles of a wing in flight, that it pivots best when one tip is on the ground.

With a happy light in his eyes, the author then states, "It worked for about a quarter of the turn, then the bottom dropped out." And how! Don't look now, Bud—that wasn't a turn but a jim-dandy spin-entry.

So—that's what made me "wonder." I turned back to page 62 and there was the title, "I Learned About Flying From That."

G. E. MILLER

Decatur, Ga.

END

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